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Proceedings of the Conference

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APRIL 4-6, 1990

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PREPARING TO MANAGE WILDERNESS IN THE 21ST CENTURY:

Proceedings of the Conference

State Botanical Gardens, Athens, Georgia, April 4-6, 1990

Compiler:

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PART I. Introduction to Nonrecreational Values of Wilderness

PREPARING TO MANAGE WILDERNESS IN THE 21ST CENTURY: AN INTRODUCTION

Patrick Reed and Barry Flamm'

"What I shall speak for is not so much the wilderness uses, valuable as they are, but the wilderness idea, which is a resource itself I intend to speak for the wilderness idea as something that has helped form our character and that has certainly shaped our history as a people. It has no more to do with recreation than churches have to do with recreation, or than the strenuousness and optimism and expansiveness of what historians call the 'American Dream' have to do with recreation."

Wallace S tegner

The notion of preparing to manage wilderness in the 21st Century is an intriguing one to consider. It certainly would be presumptuous to state with any confidence what the future holds in store for the National Wilderness Preservation System (NWPS) over the course of the next 100 years--indeed whether it will survive in a manageable or even recognizable state. Such being the case, it is surely difficult to prepare for. However, by the beginning of the next century we can be certain of this: Wilderness may be our Nation's foremost means of preserving biodiversity; its unparalleled scientific laboratory for studying the environment; its most unique setting for developing the human potential; and its efficient producer of natural resources and cultural amenities.

We can also be certain that the challenges facing wilderness and other remaining American wildlands in the 21st Century will be unprecedented. This nation is growing in population, with an associated "demand" for more room to spread out, more natural resources to feed the economy, more land for agriculture, and more water for everything. Its growth will not only burden the quality of the environment with impacts that respect no political boundaries, such as "wilderness," but will also fuel the debate over the preservation of existing and additional wilderness. Even more difficult to control, if not equally problematic, will be the global influences of human-induced climatic change, industrial pollution, and catastrophic disasters of the scale of Chernobyl.

These realities we can and must prepare for now. But, how should we begin? We could start by looking at where we have come from. A familiar catch-phrase during the first 25 years of the NWPS was that the management of wilderness is not business as usual, a reference to the inappropriate transferral of some traditional land and resource management practices to wilderness. All too often, there was a temptation to employ within the boundaries of wilderness the standard forest, park, wildlife, and range management practices long accepted as correct, economical and otherwise acceptable. Fortunately, principles like "nondegradation" and "minimum tool" have now come to replace other maxims in the management of wilderness.

It seems fair to hypothesize that whatever popular acceptance and measure of protection wilderness now enjoys probably can be traced in large part to its identification as a setting for "solitude or a primitive and unconfined type of recreation." That identification was undoubtedly a useful and even necessary connection in the past, as the idea of wilderness fought to compete for recognition and acceptance among land managers and the public alike. So it is somewhat ironic that the association with recreation has now led to a degree of

'Respectively, Conference Chair and Society of American Foresters' Wilderness Management Working Group Chair.

preoccupation with it and an unintended consequence of limiting the fulfillment of the wilderness ideal.

Wilderness is, of course, more than an exceptional setting for solitude and recreation. By public law, wilderness is a resource, with multiple public purposes that include scenic, scientific, educational, conservation, and historical uses (and other nonconforming uses) in addition to recreation (1964 Wilderness Act, Section 4b). To these statutory purposes many would add recognition of other so-called "nonrecreational" uses, such as the capability of wilderness to preserve representative biodiversity and opportunities for human development and spiritual uses. There should be no mistake that the concept of wilderness as a resource, with multiple uses, either decreases or increases its popular value as a setting for solitude or primitive and unconfined forms of recreation--nor any other single use, for that matter. Each wilderness use rightfully deserves continued and equal attention to planning, management, education and research if an enduring resource of wilderness is to be preserved for the American people of present and future generations.

Thus, we can begin to prepare to manage wilderness in the 21st Century mindful of Representative Bruce Vento's recent call for a "revolution in wilderness management." We should once again say that the management of wilderness is not business as usual, this time meaning that equal attention should be given to preservation, scientific research, human development, and other amenity uses. We should, as Wallace Stegner said, speak for the resource of wilderness.

It was in this spirit that the conference **Preparing to Manage Wilderness in the 21st Century,** was dedicated. A follow-up to the 1988 **National Wilderness Colloquium, the** objectives of the conference were twofold: (1) to increase awareness and appreciation of the full range of wilderness resources, values, and management issues and solutions; and (2) to improve communication and cooperation among the wilderness community by providing a better sense of the respective roles of all involved in managing the nonrecreational wilderness uses.

The many excellent presentations at the conference were given by a wide variety of speakers, including wilderness managers, educators, researchers, representatives of conservation and professional resource management organizations, and a representative of Congressional offices. The ideas and views of the speakers provided the foundation for a number of formal and informal group discussions during the course of the conference.

The papers in this Proceedings are the record of that conference. Part I of the Proceedings also contains the keynote address of Jane Yarn and the "Athens Resolution," a statement summarizing the findings and recommendations of the participants of the conference.

Mike McCloskey, Craig Allin, Ken Cordell and Pat Reed, John Peine and Glenn Haas provide an overview of the important nonrecreational values of wilderness and their place in the past, present, and future of the Nation in Part II. In Part III, Reed Noss, Owen Williams, Nancy Driver and Stan Ponce, Keith Corrigall and Kent Schneider, Dave Ross, Ed Krumpe, Dave Parsons and David Graber, Pat Reed and Linda Merigliano, Frank Beum, and Barbara McDonald discuss the management of wilderness for certain nonrecreational values and uses.

In Part IV, Anne Fege, Dave Heffeman, Jen Coffey, and Keith Corrigall describe the positions of the federal agencies regarding management of nomecreational uses in wilderness. Jim Bradley, Joe Roggenbuck, Paul Weingart, Steve McCool, Marty Sorenson, Jim Coufal and James Absher address the roles that others may play in meeting the management challenge in Part V. It is with gratitude to all the conference presenters, authors, and sponsors that these papers are herein made available.

During the conference, Keith Corrigall, Chief of the Bureau of Land Management's Branch of Wilderness Resources, humorously but correctly expressed a concern about the title of the conference. He noted that we must begin to face the problems of the 21st Century now, and not wait 10 years until the year 2001. With this premise we concur. Neither the problems nor the opportunities of wilderness we face today will wait.

A WILDERNESS PERSPECTIVE INTO THE 21st CENTURY: KEYNOTE ADDRESS

Jane Yarn'

Our purpose in attending this conference is to discuss and deliberate on one of my favorite subjects-wilderness. Wilderness protection, as wonderful as it is, has brought with it new problems, particularly in management techniques. Nevertheless, it is really exciting to look back and reflect on how far we have come in the past 100 years in the effort to protect our natural resources. I am so glad to have participated personally in this effort for the past 25 years. Lately, because of events such as Earth Day, new militant protection groups, greater public awareness of environmental problems, the environment being "in", and my own restlessness with the status quo, I have run the risk of thinking about the future of the protection business, and have even formed some conclusions as to what we might see ahead. Tonight, I shall throw caution to the wind and do what most thoughtful people avoid and include some futuristic thoughts in my remarks.

Back around 1886, people such as Muir, Marsh, and others were telling the nation, which acted like there was no end to our resources, that we should slow down and stop squandering our precious resources. We needed to put aside some of the rare wonders of nature for our descendants to enjoy as we have been able to. Luckily, there was enough attention paid to our environment to result in the formation of the American Forestry Association (AFA). The AFA led the effort to create a presidential authority to set aside lands to be protected under the public domain. This, of course, angered the timber industry, especially in the West where most of the protected forests existed. Nevertheless, Gifford Pinchot continued to work on protecting forest lands. The Audubon Society and Bird Grimmel (founder of the Audubon Society) led the effort to get the Park Protection Act of 1894 passed. In 1903, the group also helped establish Pelican Island, the first wildlife preserve. The Antiquities Act of 1906 followed. The National Park Act was passed in 1916 after the famous Hetch Hetchy Valley controversy, where "preservationist" and "conservationist" differences arose. This Act provided more protection for lands under the clause, "use without impairment." The Sierra Club and others successfully used this clause in the 1950s against the dam builders to prevent Dinosaur National Monument from being flooded as a result of damming the Colorado River.

This protection of wildlands began to be more refined when Bob Marshall, Aldo Leopold, and others developed the idea of legislation that would replace unreliable administrative designations of wilderness with wilderness areas that were established by law, and thus, impregnable. The Wilderness Society was formed in 1935 and the executive director, Howard Zahniser, drafted such a bill in 1956. When this bill finally passed in 1964, 9.1 million acres of wilderness were designated for protection.

'Wilderness protection, as. wonderful as it is, has brought with it new problems, particularly in management techniques.

The next landmark event is probably the book by Rachael Carson, Silent Spring, which came to us in 1962. Even though Silent Spring was a best seller and brought about a new approach to the environmental movement, including laws to correct these assaults to our lifelines, the general public felt the job was done, that we were safe from the ills of pollution, and that everything was going to be okay. The emphasis has now changed from protection of our land resources to a concern for the ***quality*** of our resources and, in particular, a concern for human

*Jane Yarn is Chair of the Georgia Chapter of The Nature Conservancy and a member of the Governing Council of the Wilderness Society. Served as Council Member, Council on Environmental Quality Executive Office of the President.

health. We now began to recognize the price we had to pay for the Industrial Revolution, which had given us seemingly unlimited conveniences and creature comforts.

OVER 100 YEARS SINCE IT ALL BEGAN: WHERE ARE W-E TODAY?

About one-third of our land mass in the United States is public lands. From the original 9.1 million acres in 1964, the amount of wilderness has grown to about 92 million acres today. More than one-half of this is in Alaska and 95% is west of the Mississippi River. Half of all wilderness areas are national park lands. We have a pathetically small amount of Bureau of Land Management land in wilderness. Of course the exercise is not over yet. Much of our wilderness is seen as being used for recreation rather than for watershed protection, protection of genetic diversity, and the preservation of natural laboratories by which the deterioration of the man-managed world can be judged and perhaps stopped. These and other non-recreational uses will be addressed by others at this meeting. Can these lands be managed (or left alone) as islands surrounded by problems that are sure to effect wilderness? How can the wilderness be protected from these threats? Could it be that we cannot concern ourselves with these areas alone, but also the many other factors that may influence them?

Some of these intrusions, would surely be included in the long list of issues we have to examine as we continue to look at the question of where we are today in the effort to clean up and preserve our environment. Even though we have accomplished a great deal in recent years, we still have major problems with the following: toxics, groundwater, drinking water, acid deposition, non-point source pollution, the economy, energy, and nuclear waste to name but a few. On the global front we have the "greenhouse" effect, ozone depletion, the destruction of tropical rain forests (54 acres per minute), the loss of species, and population issues. As a result of getting deep into correcting these problems, we have found there were many more problems. Furthermore, the problems we knew about were worse than we thought.

What have we done? What are we doing? We have passed many laws that should have done the job, but they have not. However, without these laws we would not have come nearly this far. Lawsuits are the recourse of the dispossessed, and environmentalists are among the dispossessed in our country. Despite the fact that a great majority of the American people now want and are willing to pay for a more healthy environment, the size of the institutions through which they must act are almost insignificant when compared to the government and the giant multi-national corporations. The combined assets of all the environmental organizations in this country do not begin to equal the assets of one third-rate oil company. The ability to go to court evens these odds somewhat, and empowers citizens in a way that non-judicial remedies cannot. This fact has led to the settlement of many disputes out of court. Thus, with the awareness that government alone cannot, and will not, do the job, citizens are getting into the act and using the courts to ensure that the agencies carry out their legal authority.

Along these same lines, we are also seeing an increase in public awareness. Environmental issues are no longer those to be discussed just among environmentalists, but among people on the street, along with the politics and the weather. What a change this is! A large increase in membership in environmental organizations is being recorded, especially in the more confrontational ones such as Greenpeace. This awareness has surely been encouraged by the media, which is now reporting environmental issues again as they did the 1970s. The outrage is now aimed at corporations and government for not being good citizens, for not obeying the laws, or even worse, endangering the lives of others.

Another barometer displaying the increasing public awareness of the environment is showing up in the fashion market. Examples include earth-tones, plastics recycled into earth forms for earrings and other pieces of jewelry; fishing line made into bracelets and necklaces; and bones, moss, twigs; and limbs which are being used in designs. The fur coat mania is another good example, with the threat to fur coat owners of paint being thrown on them if they wear fur on the streets.

WHAT ABOUT THE FUTURE?

Thomas Lovejoy said, "Most of the great environmental struggles will be either won or lost in the 1990s... by the next century it will be too late." According to Senator Albert Gore, "What is going on in the global environment is completely unlike anything we have ever experienced." I agree completely with both of these statements. I believe that we will see an enormous increase in the concern about environmental problems, especially those problems which threaten human health and survival. In spite of this, it will be difficult to change American lifestyles. However, I do feel an energy. Something is approaching. Something that needs no encouragement--it seems to have its own momentum. Could it be that we are moving from the "Industrial" Revolution into the "Environmental" Revolution?

I attended a symposium recently where the question of national defense was discussed not in military terms but rather in the context of the environment, education, health, and economy. It was very exciting to hear discussions about issues that really count without having to waste our resources on preparation for wars--wars that are now more pointless than ever before, and which certainly would be a no-win situation for everybody. There are new and exciting things happening around us, and I believe there are a lot more to come.

New, creative initiatives are bubbling-up and there is a greater urgency to local problems. Federal influence has declined due to chronic budget deficits, a continued pummeling of federal agencies, and partisan stalemates between the executive and legislative branches.

The next decade will see local and global problems as primary concerns. Local issues involve the despoliation of the immediate environment-- groundwater contamination, air pollution, toxic poisoning, and contamination of food by pesticides. Global issues pose a danger to human habitation of the planet. Such global issues include global warming, climate change, the greenhouse effect, and ozone depletion.

Environmental issues are no longer those to be discussed just among environmentalists, but among people on the street, along with the politics and the weather.

I believe we can expect more environmental disasters such as Bhopal, Chernobyl, and the ***Exxon Valdez.*** Acid-deposition, degrading water supplies, and air quality deterioration will all call for corrective measures. The public is going to be there demanding change. The disposal of garbage and the lack of adequate landfills will require that we take measures to recycle and be less wasteful. The "throw-away" society will begin to give way to a more conserving society. More radical solutions to environmental problems will find broader acceptance, as there will be more support for groups that advocate direct action and confrontational tactics.

Conflicts over natural resources will increase and become more intense. With the expected increase in the world population, the strain on natural resources will be unprecedented. Gus Speth, president of World Resources Institute, said, "We are reaching the saturation point globally as world population escalates to a projected increase from five to ten billion people by 2050." The users, especially those who will benefit economically, will be better organized and even more determined in demanding their rights to exploit public resources.

Our leaders will soon recognize that they are an important part of the problem. The public will begin to point this out to them. We do not have a single world leader that has put priority on environmental issues. They must recognize that the threat to our environment is far more important than the threat of nuclear war, missile-gaps, "Star Wars," crime on the streets, the national debt, the foreign trade deficit, communism in Nicaragua, world hunger, the current state of the economy, or any number of the other issues that occupy the front pages of our daily newspapers. I predict we will have more "green" tickets in the political races, as well as public pressure through the courts to achieve some of the demands for a cleaner place to live.

Gaylord Nelson says, "Public lands issues are becoming a smaller and smaller piece of the ever-expanding environmental pie." As the population continues to move more and more to urban and coastal regions, they distance themselves more from the federal lands. Therefore, federal lands shall be looked on as a quality-of-life issue, except perhaps by Westerners. The wilderness designation process is coming to an end, with RARE II forest wilderness legislation being almost complete, except for Idaho and Montana. Furthermore, the Bureau of Land Management wilderness designation process is reaching legislative fruition.

Well, back to the purpose of this event, which addresses wilderness issues and how to deal with them in the best way. I would suggest to you that these areas are not exempt from intrusions from the many other problems mentioned tonight. So, like it or not, I believe these other issues have to be brought into the deliberations. How do they fit into the management equation? How much of this other must we worry about? How will they affect the wilderness? How can we measure or judge before irreparable damage is done?

I shall anxiously await the results of your deliberation and look forward to learning from the experts. Thank you for having me, and best wishes to you in your work here.

THE ATHENS RESOLUTION

Preparing to Manage Wilderness in the 21st Century: A Conference was very fruitful in terms of informing participants as well as generating new ideas. At the close of the conference, participants were asked in small groups to share their thoughts on improving awareness and management on the nonrecreational uses and values of wilderness. The most common findings and recommendations, in the form of a joint conference resolution, were compiled for distribution and publications in the proceedings. That joint conference resolution, the "Athens Resolution" follows below:

THE ATHENS RESOLUTION

WHEREAS, the Society of American Foresters' Wilderness Management Working Group; the USDA Forest Service, Southeastern Forest Experiment Station; the Bureau of Land Management; The Wilderness Society; and the University of Georgia co-sponsored Preparing to Manage Wilderness in the 21st Century: A Conference held at the State Botanical Gardens, Athens, Georgia on April 4-6, 1990; and

WHEREAS, the Conference was a public forum to improve awareness and knowledge of the values, issues, and management of nonrecreational uses of the National Wilderness Preservation System; and

WHEREAS, the Conference was attended by wilderness managers and researchers, educators, students, conservation and professional forestry and natural resource organization representatives, and the general public from across the Nation; and

WHEREAS, it was recognized that by Act of Congress the preservation of an enduring resource of wilderness is a benefit to the American people of present and future generations, and also that wilderness has multiple and equal public purposes, including recreational, scenic, scientific, educational, conservation, and historical uses; and

WHEREAS, it was acknowledged that wilderness also has outstanding value to preserve the natural biological diversity of the Nation's plant and animal species and representative ecosystems, to preserve opportunities for spiritual experiences bound with nature, and to preserve opportunities for the development and rehabilitation of the human potential; and

WHEREAS, it was acknowledged that wilderness has rich philosophical, political, scientific, spiritual, and other cultural foundations; and

WHEREAS, it was acknowledged that human activities within and outside wilderness may threaten the preservation of wilderness and thus necessitate the management of wilderness in order to protect and rehabilitate wilderness character; and

WHEREAS, it was acknowledged that the management of wilderness for recreation and nonrecreational values requires a partnership among Federal agencies, conservation and professional forestry and natural resource organizations, schools and universities, and the general public; and

WHEREAS, a number of opportunities to improve the management of wilderness, especially for nonrecreational purposes and uses were identified; and

WHEREAS, participants of the Conference wish to express their findings and recommendations concerning wilderness and its nonrecreational values through joint resolution, no hereby

RESOLVE to most strongly recommend that the Society of American Foresters

- ***(1) adopt a comprehensive land ethic statement in its Code of Ethics;***
- ***(2) adopt a policy recognizing wilderness as a national resource having multiple public purposes as stated in the 1964 Wilderness Act and other significant forest and natural resource legislation; and***
- ***(3) develop formal partnerships with Federal agencies, conservation and professional forestry and natural resource organizations, and schools and universities to improve public awareness of wilderness and other conservation values; and***

RESOLVE to most strongly recommend that the Forest Service, National Park Service, Fish and Wildlife Service, and Bureau of Land Management

- ***(1) create job series for wilderness management, including educational requirements and standards of***

accountability, and promote in-service training;

(2) complete separate, comprehensive management guidance plans for every wilderness utilizing interdisciplinary teams and adoption of the Limits of Acceptable Change (LAC) planning process for all wilderness values; and

(3) increase research into all aspects of wilderness values and management; and

(4) implement the recommended actions of the 1985 "Five-Year Wilderness Management Action Program," with particular emphasis on interagency coordination and consistency, developing interdisciplinary wilderness management training and convening a task force review of the Management Action Program; and

(5) develop formal partnerships with conservation and professional forestry and natural resource organizations, and schools and universities to improve public and Federal agency awareness of wilderness and other conservation values; and

RESOLVE to most strongly recommend that the Nation's schools and universities

(1) include basic environmental education courses in primary, secondary and college-level curricula; and

(2) increase forestry and natural resource student exposure to wilderness values and management theory and techniques; and

RESOLVE to most strongly recommend that the Congress of the Untied States

(1) assist Federal agencies in their wilderness management responsibility by allocating funds sufficient for highest quality planning, management, training and education, and research:

(2) where appropriate, specify significant nonrecreational values in wilderness designation legislation; and

(3) consider the adequate preservation of representative ecosystems of the United States as an objective in the completion of the National Wilderness Preservation System.

/s/ Patrick Reed,
Conference Chairperson
Athens, Georgia
April, 1990

PART II. The Place of Nonrecreational Values of Wilderness in the Past, Present, and Future

EVOLVING PERSPECTIVES ON WILDERNESS VALUES: PUTTING WILDERNESS VALUES IN ORDER

Michael McCloskey*

To manage wilderness well, one must understand why people want to have wilderness and what they are seeking to find there. Attempting to answer this question has always involved a complex and elusive inquiry into deeply held beliefs that reflect various strands in our culture. A growing literature exists on this subject.

INTRODUCTION

However, there is a need to draw these elusive thoughts together into a coherent picture and to understand their evolution. One needs a shorthand way of referring to them and to see which ones are the primary and which the subsidiary ideas. In short, practical managers need a taxonomy or schema for organizing and classifying these ideas. Because of the rich, cultural associations of these ideas, they resist being pigeon-holed and indeed cannot be in the final analysis. But one gains overall understanding by organizing them and indeed better understands how they reflect our culture.

It should also be admitted that there is no definitive Linnean system for organizing such ideas. Indeed, I have explored different ways of organizing these rationales for wilderness over the years and have put forth two different schemes in the last year alone. However, in this paper I will attempt to set forth the most comprehensive scheme I have been able to think of (table 1). I have attempted to address a number of questions put to me by Patrick Reed and have c awn heavily on a summary of valuations he prepared based on a search of the literature.

At the outset, we should be clear about what implicit questions we are addressing in these efforts. This taxonomy addresses the question of WHY--why people want wilderness. Descriptive characteristics of wilderness address the implicit question of WHICH--which areas qualify as wilderness; this taxonomy does not directly address questions of "which," just "why." Furthermore, this taxonomy does not attempt to deal directly with questions of WHAT--what to do in managing them, though there are inferences that can be drawn from the valuations. It is in the context of management that one looks at statutory and prescriptive directives; they provide the point of departure, but I do not deal with them here.

Now various bases have been suggested for taxonomies. Over a year ago, the Southeastern Experiment Station sponsored a conference on the non-recreational values of wilderness, and many of us elaborated there on the non-recreational values of wilderness and came to see that recreation is declining in its importance in the scheme of wilderness values. One could try to use recreation as a classifying concept. After reflection, though, it strikes me that recreation's presence or not only adds up to a distinction and does not constitute a fundamental principle of organization. In other words, it enables one to sort valuations into two piles, but little more.

To manage wilderness well, one must understand why people want to have wilderness and what they are seeking to find there.

Similarly, one can reflect on the fact that a distinction exists between those values that are totally dependent on wilderness and those that are commonly associated with it but which may be found elsewhere, too. Indeed, I have examined a list of wilderness values and am inclined to think that most of them are associated and not dependent (and some are merely incidental). Again this distinction does not provide an organizing principle that allows one to sort values into a series of related groups.

*Chairman, Sierra Club.

A good organizing principle for classification allows one to sort like ideas into categories and to see relationships along a line of progression. To date, two organizing principles have suggested themselves to me. One is to organize ideas in terms of utilitarianism and the degree to which the ideas either reflect highly utilitarian values (i.e., anthropocentric values), or move in the opposite direction toward biocentric and inherent values. I set forth a scheme along these lines at last fall's celebration of the 25th anniversary of the Wilderness Act. That effort, however, left dangling questions that Patrick Reed has raised about the differences between uses, benefits, and values. To address those distinctions, I am now setting forth an alternative scheme built around those concepts but which embraces some of my earlier scheme and also goes further and includes more values (based on Reed's literature review).

The meanings associated with wilderness keep growing in richness and subtlety.

This scheme is based on the principle of concreteness as opposed to abstraction. Those ideas which are most abstract and idealistic are at one end of the spectrum and those which are most concrete and mundane are at the other end. In this scheme, a value is a more abstract concept; a benefit is a less abstract one, and a **use** is a more concrete notion. A value is regarded as a reason, rooted in philosophy and culture, for wanting wilderness; it can be held both by individuals and society. A benefit is regarded as an advantage enjoyed by society collectively and usually has a more practical orientation. A **use** is a way individuals or groups utilize wilderness to gain satisfactions, and the use can be vicarious and off-site as well as on site. There are linkages between these categories with, for instance, some of the uses drawing heavily upon values for their inspiration. Curiously, the benefits seem to stand somewhat by themselves. The answer may be found in the realization that they represent to some degree potential uses by society, not by individuals, or rather theoretical uses by society collectively.

As I have classified ideas in terms of this scheme, I have also looked--at least in a cursory way--at the historical origins of the ideas. As one might expect, most of the more biocentric reasons for valuing wilderness are of recent origin (i.e., in the last 30 years), whereas most of the more anthropocentric reasons are rooted in our culture and go back at least to the 19th century. Most of the ideas regarding use emerged in the mid-20th century, though a few are older. In my text, I indicate the decade of emergence in parentheses by each item; this is the time when I perceive the idea began to gain currency, though someone may have planted the seed earlier. In the future, it would be useful to document the origin and emergence of each more explicitly.

In looking over the dates shown, it is striking that this font of ideas keeps nourishing such a rapidly expanding literature and culture. The meanings associated with wilderness keep growing in richness and subtlety.

CONCLUSION

In this taxonomy, I am sure I will not have accounted for every idea and every nuance. The test of the validity of the system will be whether it can accommodate new and additional ideas and stand elaboration. I hope it can and that it makes sense and will be found useful.

But even if it does not, at the very least I hope it causes further reflection on the various reasons that explain why wilderness has become so valued and that my effort prompts someone else to carry the work forward.

Table 1. A proposed taxonomy of wilderness values.

I. VALUES (Philosophical reasons for wanting wilderness.)

A. Biocentric Reasons (Values accruing to nature.)

1. **Inherent Reasons** (1980s). Those reasons needing no articulation and which reflect the notion that wilderness is valued "because it is there."

2. Freedom For Nature (1970s). This is the idea that rights inhere in the wild things of the planet to go their own way untrammelled and unfettered by our species (homo sapiens)--that they have a right to their freedom and the dignity involved in its exercise. Wilderness is the place where this freedom finds fullest expression. Phrases are used in this connection referring to wilderness as a "reservoir of freedom for biota" and as "regions of ecological freedom."

3. Evolutionary Destiny (1960s). Wilderness is the place where evolution can still work to bring forth new species, where gene pools are diverse enough and ecosystems healthy enough for evolution to produce its wonders. Here biota can find their separate destinies as evolution unfolds.

4. Sharing The Planet (1890s--e.g., Muir). This is the idea that humanity shares the planet with other forms of life and that these forms need their homelands, which are wilderness. It is the part that belongs to them, though they are co-tenants with us elsewhere.

5. Refugia (1980s). Wilderness is a refugium for all of the species that survive there and can re-emerge again if given a chance.

6. Memorial To The Unspoiled (1980s). Wilderness memorializes all of the wildness of the earth which has been lost; it is a symbol of hope in a degraded world because it remains unspoiled.

B. Anthropocentric Reasons (Values accruing to homo sapiens as an expression of culture.)

1. Ethical Reasons (1940s--obligations to nature). Wilderness is the object of feelings that our species has ethical obligations of restraint and humility toward nature, and wilderness is the fullest embodiment of nature. The feelings draw upon Schweitzer's idea of "respect for life," Leopold's "land ethic," and E.O. Wilson's idea of the "brotherhood of life" (1980s). Humility and restraint are indicated because our species is not 'wise enough to presume to plan how the whole planet should work, we do not know enough to interfere in everything. As we face the mysteries of wilderness, we often do not even know the right questions to ask. We will make everything worse if we insist on remaking all in our own image--to reflect our passing imperatives. We should not act like gods.

2. Religious Reasons (1830s--e.g., Bryant and Emerson). Wilderness is a place of religious significance or solace; it is a place to seek a spiritual experience--a place to celebrate, realize or reinforce a sense of connection with all things of an ultimate nature and of being subject to greater powers (e.g., "Temple of Nature," "nature as a manifestation of God" (Thoreau)); some now see evolution as the way in which God continues the process of creation.

3. Esthetic Inspiration (19th Century). Wilderness has also served as a source of inspiration and subject for those who create art (e.g., Catlin, Moran and Church), literature and music and has shaped culture in the process.

4. Intellectual Traditions (18th and 19th Centuries). Wilderness as a pure expression of nature has been the setting for various political theories such as "primitive utopianism," "returning to nature," "the simple life" (Thoreau), "a place of freedom" (Thoreau), "idealization of the commonplace" (Whitman), "threats to nature" (Marsh), and as the ultimate source of freedom from oppression and industrialism (Nash 1982).

5. Historic Symbol (1960s).
   a. Wilderness is a reminder of what having a frontier meant in shaping American culture:
      --"crucible of American character" (Nash);
      --symbol of national pride in America's scenic grandeur;
      --symbol of what once was a place to build a better life (Stegner 1960s).
   b. It is also a contemporary symbol:
      --a symbol of identification with nature (Knopf 1987)--"oneness with nature";
      --a symbol of our biological roots--of our evolutionary past;
      --a symbol of stewardship decisions and embodies anti-anthropomorphism.

6. Nurturance (1970s). Wilderness is valued because it has the capacity to nurture human development (see uses below, especially "personal development").

II. BENEFITS TO SOCIETY (Collective advantages.)

A. Intangible.

1. Source of Survival. "In wildness is the preservation of the world" (Thoreau).

2. Sustainer of Culture. (e.g., of the values set forth in section I-B above.)

3. Options For Future Generations (1950s).
   a. A place to enjoy; it has been saved for their use.
   b. Reversible decisions: some reversible land use decisions are left for future generations to re-visit should they care to.

4. Disaster Hedge (1980s). Wilderness areas provide a hedge against ecological disasters by serving as buffers.

5. Stewardship Training (1970s). Wilderness designation trains citizens in far-sighted stewardship and public decision-making.

B. Tangible (Protects future well-being of society.)

1. Non-Economic Benefits.
   a. Breaking up development. (1980s--Australia) Wilderness areas break development up into blocks which are less oppressive.
   b. Alternative supplies (1980s--Australia). Designation of wilderness provides a spur to finding alternative supplies of natural resources and saves time in the transition process.
   c. Ecological services
      (1) Reservoir of normal ecological processes. (Nash)
      (2) Air quality (1980s). Wilderness areas provide improved air quality to nearby areas.
      (3) Geophysical function (1980s). Vegetation in wilderness areas helps to moderate and improve weather and climate through contributing to cloud moisture and serves as a carbon sink which can offset emissions of carbon dioxide and mitigate global climate change.
      (4) Watershed Service (1880s). Wilderness contributes a pure and steady flow of water to downstream areas, reduces floods, and provides places to recharge aquifers.

2. Economic Benefits.
   a. Emergency resources (1950s). While wilderness designations are expected to be permanent, decisions can be reversed to allow access to resources in them in cases of emergency.
   b. Spin-off benefits (1980s). Wilderness areas may serve as valuable backdrops for resorts and occupancies located on adjacent lands, enhancing land values and tax revenues. Resort communities may thrive by proximity to wilderness areas.
   c. Recreational expenditures. Wilderness use prompts expenditures by recreationists visiting them, both for equipment and while traveling enroute. These outlays benefit the economy.

III. USES

A. For Introspective Experiences. Wilderness provides a setting to search for experiences which are profound because:
--they involve visits to sacred sites;
--they involve "self-other" experiences ("other" being connections with God, things felt to be sacred, or that change one's life or world view);
--they are contemplative or reflective (without the distractions of technology and society) and evoke feelings of wonder, inspiration, or connection with other life forms.

B. For Science and Research.

1. Baseline Control Plots (1940s). Wilderness provides benchmarks to compare against disturbed areas to understand ecological change; to demonstrate how normal, healthy land maintains itself (Leopold 1941).

2. Pursuit of New Knowledge.

a. Non-intrusive (1950s).
(1) Wilderness provides an ideal place for research into species diversity, habitat needs, life cycles, forest succession, and ecology. It is a place where new discoveries can still be made by systematists.
(2) It is a place to learn about interconnectedness.
(3) It is also a place to obtain documentation of events connected with artifacts remaining there (history) and can serve as a laboratory for social science research (e.g., on wilderness users).
(4) Wilderness preserves options for future researchers to obtain answers to questions we do not yet know how to ask.

b. Intrusive. Some knowledge is gained in wilderness areas by intrusive means such as:
(1) with snow-pack and weather monitoring equipment placed there (1960s);
(2) and through excavations of small areas (1980s) for purposes of archeological or paleontological research.

3. Gene Banks (1960s). Wilderness areas can serve as banks of genetic diversity (both among and within species) which can serve many scientific purposes.

C. For Wildlife Habitat. To provide an undisturbed setting for plants and animals to thrive without having to compete with human ambitions.

D. For Education and Outdoor Learning.

1. Nature Study (1960s). Wilderness is an ideal place to study nature, ecology and evolution; to satisfy a quest for understanding or satisfy curiosity.

2. Environmental Education (1970s). Wilderness can be used for environmental education programs, particularly to instill a sense of individual responsibility.

3. Wilderness Skills And Training (1970s). Wilderness is a place to impart wilderness skills (navigation, self-sufficiency, and survival).

E. For Personal Development.

1. To Stimulate Creativity (1980s). Wilderness is a place well suited to stimulating creativity.

2. To Develop Character (1970s). Wilderness is used as a place to develop character (self-esteem, confidence, competence, achievement, independence and being willing to take responsibility) through:
a. gaining self-discovery and awareness (self-concept);
b. self-realization (self-actualization);
c. learning to relate well to others (cooperation);
d. and by learning to take risks (useful in business).

3. Therapy (1960s--e.g., S.Olson). Wilderness (as a place for therapeutic camping) can be used as a place to restore mental and physical health (rehabilitation for the disabled); it is a place to be free of social repressions (Marshall 1930).

4. Maintaining Health (1960s). Wilderness is utilized to maintain health through gaining physical exercise (fitness) and mental refreshment by escaping from the daily patterns of life (reduced tensions).

F. For Enjoyment (now or in the future). Wilderness is a good place for:

1. "Knowing It Exists." Regardless of whether one uses it or ever intends to.

2. Escaping **Noise And Crowds.** To obtain solitude, tranquility, isolation, and privacy.

3. **Enjoying Nature.** Contact with unadulterated expressions of nature.

4. **Celebration (1980s).** As a place to celebrate the values associated with wilderness.

5. **Natural Beauty (1870s).** As a place to enjoy natural beauty and enlarge one's capacity for inspiration and wonder; a "place of perfect esthetic experience" (Marshall 1930).

6. **Outdoor Adventure** (18th and 19th Centuries). As a place to seek danger, challenge, adventure and freedom in an unconfined and unpredictable environment.

7. **Wilderness Sports/Recreation.** (often with companions where sociability is important, and providing opportunities for leadership in group sports).
   a. Non-consumptive (1960s). As an ideal place for hiking, backpacking, nature observation, mountaineering, river running, canoeing, caving, etc.
   b. Consumptive (1920s). As a place for angling, pack hunting, enjoying campfires (firewood), and gathering (berries, nuts, mushrooms, and edible plants).
   c. Non-conforming: pre-established floatplane and motorboat use.

G. For Subsistence.

1. **Non-natives.** Wilderness can provide a source of food for subsistence **(e.g.,** meat from hunting). In rare circumstances it may play a role in survival too.

2. **Natives** (1970s). In Alaska wilderness is used as a source of food and material by natives living traditional life styles.

H. For Economic Purposes.

1. **Less Commercial Uses** (serving public purposes too). Wilderness can be used as a source **of:**
   a. Gene stocks (1980s). By propagators who collect seeds and tissues; some of these can be used for medicines.
   b. Water Supply (1920s). Wilderness provides clean and dependable **flowage** for downstream water users (e.g., municipal and irrigation).

2. **More Commercial.**
   a. Conforming (conforming to wilderness ideals):
      --packing and guiding services (1920s);
      --rafting services (1970s);
      --scenery for commercial photography and advertising; sells **film** and cameras.
   b. Non-conforming (contrary to wilderness ideals, but legal in the United States under the Wilderness Act of 1964):
      --grazing by cattle and sheep (pre-established allotments);
      --trapping;
      --mining on established claims (filed prior to 1984);
      --inholdings and occupancies on them;
      --pipelines and transmission lines (in some authorizing statutes);
      --water projects (pre-existing or with Presidential authorization);
      --navigation and communication equipment.

CONGRESS OR THE AGENCIES: WHO'LL RULE WILDERNESS IN THE 21ST CENTURY?

Craig W. Allin*

ABSTRACT

The level of Congressional involvement in wilderness management has increased significantly since 1964. Evidence for this proposition can be found in authorization measures, appropriations measures, and oversight activities. ***Increased Congressional involvement is consistent with the view that wilderness politics has undergone a shift from what Theodore Lowi has called the distributive arena to the regulatory arena. Further application of Lowi's policy typology facilitates educated speculation about the future politics of wilderness management and the role of agency professionals in that future.***

MECHANISMS FOR CONGRESSIONAL CONTROL

Broadly speaking, Congress has two overlapping mechanisms for the control of administrative agencies: legislation and oversight.

Legislation itself takes two distinct and important forms: authorizations and appropriations. In overly simple terms, the former provides an agency with the legal authority to accomplish a task, the latter with the money to do so. In practice, appropriations measures may attach strings to the money provided, thus altering the agency's legal authority and clouding the distinction between the two types of legislation.'

In the case of wilderness, the role played by authorization and appropriations measures respectively has been influenced by compromises enshrined in the Wilderness Act (PL 88-577) itself.

Fist, Congressman Wayne Aspinall, chair of the Interior Committee, was able to insist that every wilderness area established under the authority of the United States be established by act of Congress (Allin 1982). The requirement of Congressional approval has not kept the wilderness system small, as Aspinall intended, but it has created a process by which wilderness remains almost continuously on the agenda of the House Interior and Senate Energy and Natural Resources committees, providing multiple opportunities for Congressional involvement in wilderness management.

The Wilderness Act and the legislation of the subsequent 14 years demonstrate a reluctance on the part of Congress to overrule the wilderness management decisions of the land management agencies. Beginning with the 96th Congress in 1979 that reluctance has been far less apparent.

A second compromise required to secure passage of the Wilderness Act is manifest in Section 2(b), which provides that no appropriation shall be available for expenses of the wilderness system per se. This provision ought to have rendered wilderness a relative nonentity in the appropriations process and insulated wilderness management from oversight by the appropriations committees. In recent years, however, the appropriations process has become an important avenue for Congressional supervision of wilderness management.

Important as they are, authorization and appropriations laws do not exhaust the Congressional arsenal. Non-statutory control of administration is called Congressional oversight. The oversight concept is broad enough to embrace formal manifestations like Congressional investigations,

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committee oversight hearings, and General Accounting Office reports and the less formal, less structured interventions of individual members of Congress as they attempt to placate politically important group interests or service the concerns of individual constituents. With so many statutory opportunities to work its will, one would think that oversight activities would be unnecessary to members of Congress, but there has been action on this front as well.

In the paragraphs that follow, I'll examine authorization measures, appropriations measures, and oversight activities in turn. Each area of activity provides evidence that Congress has evolved from a relatively laissez-faire approach to wilderness management to a posture of greater involvement. The transition from the early period to the current period is marked, symbolically at least, by passage of the Alaska National Interest Lands Conservation Act.* After presenting the data, I'll attempt to explain why this shift has taken place and what it portends for the future.

MANAGEMENT DIRECTION IN AUTHORIZATION STATUTES

Let us look first at authorization measures beginning with the Wilderness Act itself. Important as it was, the Wilderness Act was remarkably effective in preserving the status quo ante regarding wilderness management. It designated only 9.1 million acres of wilderness, and each acre had already been designated by the Forest Service under its U-regulations. Where the Forest Service had demonstrated ambivalence by leaving areas classified as primitive under the old L-20 Regulation, Congress sanctioned that ambivalence by calling for further study, exactly what the Forest Service would have done without the Congressional mandate. The general prohibitions concerning commercial enterprises, permanent roads, motor vehicles, and buildings reflected the existing policy of the Forest Service as set forth in the U-regulations. Furthermore, the statutory exceptions allowing specified use of motorboats and aircraft, continued grazing, and special management for the Boundary Waters Canoe Area reflected identical or nearly identical exceptions previously established by the Forest Service. In terms of wilderness management, the Wilderness Act's major break with precedent was its cautious prohibition of prospecting some 20 years in the future. Since the Forest Service lacked authority to regulate prospecting, the prohibition repudiated no agency policy.

The Wilderness Act and the legislation of the subsequent 14 years demonstrate a reluctance on the part of Congress to overrule the wilderness management decisions of the land management agencies. Beginning with the 96th Congress in 1979 that reluctance has been far less apparent.

I base these conclusions on a content analysis of wilderness-related authorization measures since 1964.3 There were a total of 128 such measures through December 31, 1988. I have examined each to determine the rate at which Special Management Provisions (SMPs) appear and whether those SMPs enhance or reduce the discretion of wilderness managers. For the purposes of this analysis an SMP is any provision of law that alters management for one or more wilderness areas.[4] I coded each SMP as discretion-enhancing or discretion-reducing according to the following formula: An SMP is discretion-enhancing if it (a) grants discretionary authority to wilderness managers beyond that provided by the Wilderness Act, (b) withdraws a private right to non-wilderness use of a wilderness area, or (c) withdraws the right of a government agency, other than the managing agency, to non-wilderness use of a wilderness area. An SMP is discretion-reducing if it commands a specific wilderness management activity or policy.'

The Laissez-faire Period, 1964-1978

Between 1964 and 1978 Congress passed 67 wilderness laws (Table 1). True to the expectations engendered by the Wilderness Act's mandatory review language,[6] Congress devoted most of its energy to wilderness allocation, substantially increasing the size of the wilderness system and often establishing wilderness areas larger than those recommended by the land management agencies.

Congressional concern for wilderness management was less frequent. Twenty-one of the 67 wilderness laws passed prior to 1979 contained SMPs with the percentage rising fairly regularly from the beginning of the period to the end. Of the 45 distinct SMPs within this body of legislation, 42 percent were discretion-enhancing and 58 percent discretion-reducing.

The greatest attention to wilderness management was elicited by discussion of what became the so-called Eastern Wilderness Act of 1975 (PL 93-622). In the Forest Service and in the agriculture committees of Congress, there was much support for a system of "wild areas" as an alternative to wilderness in the East. Such an approach would have served the Forest Service's purity policy' and the jurisdictional interests of the proponent committees, but the interests of the environmental lobby and the interior committees prevailed. In the end the Eastern Wilderness Act had little impact on wilderness management.

Table 1. Statutory measures excluding appropriations, 1964-1978.

Congress (years) (a)	Total wilderness related laws (b)	Laws creating or enlarging wilderness areas (c)	Laws with SMPs (d)	Column (d) as a percentage of column (b) (e)
90th (1967-1968)	6	5	1	16.67
91st (1969-1970)	6	3	1	16.67
92nd (1971-1972)	17	9	2	11.76
93rd (1973-1974)	11	4	4	36.36
94th (1975-1976)	13	7	5	38.46
95th (1977-1978)	14	7	8	57.14
Total (1964-1978)	67	35	21	31.34

The legislative history of the Endangered American Wilderness Act of 1978 (PL 95-237) provided a thorough airing of views on the Forest Service's purity policy. The act's passage was an implicit rejection of the Forest Service view that the "sights and sounds of civilization" disqualified an area for wilderness status, but the act itself was silent on issues of general wilderness management.

Congress's most important foray into wilderness management during this period may have been the Clean Air Act Amendments of 1977 (PL 95-95). A complex system of regulation was imposed to prevent significant deterioration in relatively clean airsheds. Wilderness areas greater than 5,000 acres were given statutory protection as class I (minimum degradation) areas, and wilderness managers were charged "to protect [their] air quality related values (including visibility)" (91 Stat. 736).[8]

More narrowly focused SMPs passed during this era withdrew specific wilderness areas from application of the mining laws,[9] canceled previously existing rights," and granted management authority--generally involving land acquisition--beyond that conferred by the Wilderness Act."

Serious efforts to micro-manage the wilderness--that is, to impose relatively specific management direction for specific wilderness areas--were rare between 1964 and 1978. In July 1976, the Alpine Lakes Area Management Act (PL 94-357) directed a special study of the Enchantment Area of the Alpine Lakes Wilderness, "to explore the feasibility and benefits of establishing special provisions . . . to protect its fragile beauty, while still maintaining the availability of the entire area for projected recreational demand" (90 Stat. 908). The following year a diverse group of Idahoans assembled by Senator Frank Church hammered out a compromise involving a number of special management provisions for the Gospel Hump area, and these became Section 4 of the Endangered American Wilderness Act of 1978. The same act overruled previous law, allowing the less restrictive provisions of the Wild and Scenic Rivers Act (PL 90-542) to govern management of the river corridor in the Wild Rogue Wilderness."

The Interventionist Period, 1979-present

Congressional involvement in wilderness management was markedly greater in the period between 1979 and 1988. Although the number of wilderness-related authorization statutes declined slightly, from 67 in the first period to 61 in the second, there were both quantitative and qualitative changes in their management content.

First, the number of statutes containing SMPs increased, from 21 in the first period to 37 in the second. (Table 2.) Second, the percentage of all wilderness-related statutes containing one or more SMP grew from 31.3 to 60.7 with no corresponding reduction in the number of SMPs per statute. Third, the effect of SMPs on wilderness managers changed, with the rate increasing discretion declining from 42 percent to 25 percent.

The qualitative changes are even more dramatic. With the exception of the Clean Air Act Amendments, few Congressional intrusions in wilderness management were of broad scope between 1964 and 1978. That changed dramatically with the 96th Congress. In terms of wilderness management, the earth moved in December 1980.

The Alaska National Interest Lands Conservation Act (PL 96-487), approved December 2, 1980, designated more than 56 million acres of wilderness, nearly three times the previous total. It authorized recreational cabins, the salvage of logs from seacoasts, and subsistence use of fish and wildlife by rural residents, all of which would otherwise have been prohibited by the Wilderness Act. In addition, national forest wilderness in Alaska was made subject to roads, facilities, structures and motor use in the name of present or future fisheries management.

The New Mexico Wilderness Act (PL 96-550), approved December 19, 1980, disavowed wildemess-protective management of areas adjacent to formally designated wilderness. This was a significant development. Section 4(b) of the Wilderness Act gave managers the responsibility to preserve "the wilderness character" of the areas designated (78 Stat. 893). By repudiating external buffers Congress effectively deprived managers of the ability to preserve the wilderness character of certain wilderness lands. This statutory buffer ban applied only to wilderness areas in New Mexico, but comparable language has appeared in national forest wilderness laws ever since.[13]

Three days later, December 22, 1980, the Colorado Wilderness Act (PL 96-560) repeated the Congressional repudiation of buffers and proceeded to an even more important intervention in wilderness management. Section 4(d)(4)(2) of the Wilderness Act provided "the grazing of livestock, where established prior to the effective date of this Act, shall be permitted to continue subject to such reasonable regulations as are deemed necessary by the Secretary of Agriculture" (78 Stat. 895). In the Colorado Act Congress declared that,

> with respect to livestock grazing in the National Forest wilderness areas, the provisions of the Wilderness Act relating to grazing shall be interpreted and administered in accordance with the guidelines contained under the heading "Grazing in National Forest Wilderness" in the House Committee Report (H. Report 96-617) accompanying this Act. (94 Stat. 3271)

The referenced report interpreted the language of the Wilderness Act so as to constrain managerial discretion: "There shall be no curtailment of grazing in wilderness areas simply because an area is . . . designated as wilderness." The report repudiated any administrative policy designed to phase out grazing and reaffirmed the use, maintenance, and construction of grazing facilities as well as certain uses of motorized equipment. The grazing management direction of the Colorado law appears to be applicable to all national forest wilderness areas, but that has not prevented Congress from repeating its reference to the aforementioned committee report in subsequent legislation.[14]

Unlike the 1977 Clean Air Act Amendments, which --at least in principle--empowered wilderness managers to resist wilderness degradation, the SMPs of the Alaska, New Mexico, and Colorado laws generally reduced the authority and discretion of wilderness managers. These three statutes were more dramatic than subsequent wilderness laws, but their discretion-reducing provisions have not proven atypical. Legislation during the interventionist period has approved non-conforming facilities and uses on behalf of mining,[15] recreation [16] traditional cultural and religious activities," and 'a wide variety of water-related development activities."

MANAGEMENT DIRECTION IN THE APPROPRIATIONS PROCESS

The impact of the appropriations process parallels that of ordinary authorization statutes in that SMPs have become more common over time. It differs in that appropriations SMPs have more frequently enhanced the power and discretion of wilderness managers, generally by restricting the wildemess-intrusive behavior of others.

Table 2. Statutory measures excluding appropriations, 1979-1988.

Congress (years)	Total wilderness related laws	Laws creating or enlarging wilderness areas	Laws with SMPs	Column (d) as a percentage of column (b)
(a)	(b)	(c)	(d)	(e)
96th (1979-1980)	9	7	7	77.87
97th (1981-1982)	11	7	5	45.45
98th (1983-1984)	23	21	14	60.87
99th (19851986)	7	4	3	42.86
100th (1987-1988)	11	7	8	72.73
Total • (1979-1988)	61	46	37	60.66

• See endnote number 4 in the text.

The power of appropriations law lay dormant during the laissez-faire period. It took the kiss of Interior Secretary James Watt to restore its vitality. Watt exercised the discretionary powers of his office to encourage increased resource development activity on the public domain, including areas designated as wilderness and for wilderness study.

On several occasions the Congress utilized appropriations measures to enhance the latitude of wilderness managers by constraining Watt's proposals for development. A 1982 statute (PL 97-276) banned the use of funds for mineral permitting or leasing in wilderness areas and in areas designated for wilderness study or further planning in RARE II. Areas in Alaska and some other areas were excepted. A year later PL 98-146 expanded the ban to include Congressionally designated and BLM wilderness study areas. Section 308 of this act provided detailed management direction for minerals in the areas affected. Similar language has been included in Interior Department appropriations measures ever since.[19]

Appropriations laws that constrain wilderness managers have been less frequent. Idaho Senator James McClure succeeded in writing a "save my constituents from predators" directive into the Interior appropriations act for fiscal 1984 (PL 98-146) and having it made permanent a year later (PL 98-473). The law provided that in the State of Idaho the Fish and Wildlife Service must designate critical habitat for the Northern Rocky Mountain Wolf coterminous with the boundaries of the Central Idaho Wilderness Areas as established by the Central Idaho Wilderness Act. A ban on activity designed to establish or augment grizzly bear populations in the national forests was also included in the Interior Department appropriations act for fiscal 1985 (PL 98473).

MANAGEMENT DIRECTION IN THE OVERSIGHT PROCESS

Congressional use of its oversight powers seems also to have increased over the quarter century since 1964. This conclusion is supported by the record of

oversight hearings and reports to Congress by the General Accounting Office (GAO).

Oversight Hearings

Since 1964 Congressional committees have held ten wilderness oversight hearings.[20] Only three of the ten were convened during the laissez-faire period, and only one gave significant attention to management (Committee on Interior 1974). In fact the most significant management result of Congressional oversight in the early era was to defeat the Forest Service's purity policy. This was accomplished, not with oversight hearings per se, but through the hearings and reports associated with the Eastern and Endangered American wilderness acts discussed above.

Of the seven oversight hearings since 1979, the two most recent focused specifically on management concerns. One questioned fire policy in the aftermath of the Yellowstone conflagration (Subcommittee on Public Lands 1988). The other examined wilderness management in the national forests (Subcommittee on National Parks 1988). Specific complaints included insufficient appreciation of wilderness values, absent or ineffective wilderness monitoring, undervaluation of and overdependence on seasonal wilderness rangers, overemphasis on timber and fire management for promotion and advancement, inappropriate administrative fragmentation of wilderness, reduction in commitment to wilderness research, and reluctance to seek the funding required to address these concerns. The Forest Service has responded to the subcommittee's concerns. Seasonal wilderness rangers who testified now have permanent appointments, and there is a new emphasis on wilderness within the agency.

General Accounting Office Reports

The record of GAO reports is comparable. Six reports have been indexed to wilderness since 1964, but only one dated before 1979 (GAO 1970). Three of five reports issued during the interventionist period dealt significantly with management. These reports have taken aim at the impact of non-federal mineral rights (GAO 1984, 1987) and national forest wilderness management generally (1989). The 1989 report grew out of the 1988 oversight hearings and generally substantiated the concerns expressed there.

EXPLAINING THE INCREASE IN CONGRESSIONAL INVOLVEMENT

Just two months before the Wilderness Act was passed Theodore Lowi published a review in *World* Politics that revolutionized thinking about public policy in America. Lowi identified three major policy types and argued that each had its own distinctive political structures, processes, elites, and group relations.[21]

The first is distributive policy. Distributive policies are characterized by concentrated benefits and dispersed costs. The benefits of distributive policies are real: the 19th century homestead, the military procurement contract, the National Science Foundation grant. The costs of the benefits provided are spread so widely that they seem to vanish. Thus, distributive policy creates the illusion of winners without losers. Needless to say, members of Congress wish all policy were distributive.

The second policy type is characterized as regulatory. According to Lowi, "Regulatory policies are distinguishable from distributive in that in the short run the regulatory decision involves a direct choice as to who will be indulged and who deprived." In short, regulatory policies are characterized by concentrated benefits and concentrated costs. When the government exercises its power of eminent domain to bulldoze a neighborhood and make room for a commercial development, there are obvious winners and obvious losers. Such policies are bound to be controversial, and they are likely to be avoided whenever possible in favor of politically safer distributive policies.

Redishibutive policy completes Lowi's typology. Like regulatory policy, redistributive policy is characterized by clear winners and clear losers. It differs from regulatory policy in that the winners and losers are not narrow, specialized interest groups but broad social classes. Use of taxation and welfare benefits to redistribute personal wealth from the affluent to the impoverished provides an archetypal example. Because redistributive policy pits broad groups like social classes against one another, redistibutive policy conflicts--such as the continuing debate over abortion policy--often take on ideological overtones and resist compromise solutions.

Each policy type has its characteristic institutions and processes--in short, its own peculiar politics.

Distributive politics is characterized by stable patterns of influence for both administrative agencies and congressional committees, often working in harmony to produce benefits for favored private interests. There is little supervision or direction from senior administrators in the executive branch, and Congress as a whole tends to defer to the decisions of its committees and subcommittees. In such an environment, policy-making tends to be informal and relatively invisible. The agencies,

congressional committees, and favored interests are happy; no one else cares.

Regulatory politics is characterized by less stable patterns of influence. The power of agencies and committees is often overshadowed by that of senior executive officials or Congress as a whole. Private interest groups are influential, but often in conflict with one another. In this more volatile environment, bargaining and compromise are the rule, and the outcomes are never certain.

Redistributive politics is characterized by relatively stable ideological polarization. The process is dominated by the President, Congress, and ideologically focused peak organizations to the relative detriment of agencies, committees, and more narrowly focused interest groups. The ideological nature and broad social impact of redistributive policy make compromise difficult. If one class is politically dominant, it is likely to have its way; if not, stalemate is the probable result.

So long as allocation overshadows management and the politics is regulatory, management direction will be treated as negotiable, and the concept of wilderness as a distinctive status with clear management principles will continue to erode.

Lowi's typology provides a framework for explaining the changes in congressional control over wilderness management already described: Wilderness has moved from the arena of distributive politics to the arena of regulatory politics?'

During the laissez-faire period, ending in 1978, wilderness policy was primarily distributive. With the exception of the Eastern and the Endangered American wilderness acts--both precursors of the regulatory politics to come--wilderness designations were the result of primitive area reviews in the national forests and roadless area reviews in the national parks and national wildlife refuges. Congressional wilderness designation added a level of protection to these areas, but they had already been reserved by legislative or administrative action, so wilderness designation did not diminish lands available for multiple-use management. Under these circumstances wilderness advocates--the favored interest group--received benefits while the offsetting costs were dispersed. Agency wilderness management was satisfactory to both committees and clientele, so there was little reason for Congress to intervene.

As the relatively easy work associated with Forest Service primitive areas and Interior Department roadless areas came to and end in the 1970s, Congress began to confront demands for wilderness allocation from the roadless inventory of the national forests generally, from the BLM lands, and from Alaska. The era of benefits without apparent costs was over, and a multitude of development interests came forward to argue against wilderness generally or for special treatment.

Beginning with 96th Congress (1979-1980) these more controversial proposals dominated the legislative agenda, forcing policy-makers to apportion costs as well as benefits. Wilderness politics moved from the distributive to the regulatory arena. With demands from conflicting groups raising the political stakes, decisions gravitated away from agencies and committees and toward the president and Congress as a whole. The main issue continued to be wilderness allocation, but the bargaining and compromise characteristic of regulatory policy was bound to spill over into management as well: e.g. "I'll agree to designate that area as wilderness if you'll agree to let me develop it anyway." Because these deals are being struck at the Congressional-presidential or Congressional-secretarial levels, the agency's professional wilderness managers watch relatively helplessly as their authority is bargained away.

All of these features are apparent in the Alaska, New Mexico, and Colorado statutes, as well as in a host of additional interventionist-period wilderness laws. In the arena of regulatory policy the agency is just one more political interest. The degree of agency autonomy characteristic of distributive politics has probably been lost forever.

WHO'LL RULE WILDERNESS IN THE 21ST CENTURY?

The discussion so far suggests that wilderness politics was distributive in the past and is regulatory in the present. What will it be in the future? In line with Lowi's scheme, I can imagine three possible scenarios and attach rough probabilities to each. I'll begin with the least probable and with the bad news for wilderness managers.

In the first scenario the politics of wilderness management falls back into the politically

comfortable distributive model, maximizing the satisfaction of agencies, committees, and wilderness advocates alike. It won't happen because the era has passed when wilderness decisions carry only dispersed costs.

For distributive politics to make a comeback in the 21st century would require a number of relatively implausible conditions. Wilderness allocation would have to be off the national agenda, and wilderness areas would probably have to be seen as single-purpose recreational areas catering to a specific clientele. If these conditions were met, wilderness managers and doting congressional committees might someday serve the interests of a dominant "organization of wilderness recreationists" as effectively as other managers and committees today serve the interests of the American Farm Bureau Federation. The benefits to the organization of wilderness recreationists would be real, and the costs would be dispersed to the taxpayers generally. This scenario maximizes the authority and discretion of management agencies, but it is the least probable.

In the second scenario wilderness politics is catapulted into the arena of redistributive politics. This scenario might result from an ecological catastrophe so great that it traumatizes everyone and forces radical rethinking about the role of the human race on earth. Just as the trauma of the industrial revolution gave rise to the ideologies of liberalism and conservatism, so too the trauma of environmental calamity might give rise to ideologies like biocentrism and anthropocentrism. Any gain by one bloc would be perceived as a loss to the other. Politically correct positions on wilderness management issues would follow naturally from each of the competing ideologies. Consistent with Lowi's model of redistributive politics, decision-making would gravitate to the top. Decisions would be made by the President, the Congress, and the representatives of the great ideological blocs. This scenario minimizes the authority and discretion of wilderness managers as well as the influence of the special interest groups which have historically been most active in wilderness politics. The second scenario's degree of plausibility depends heavily on one's optimism about avoiding environmental disaster.

In the third scenario wilderness politics continues to be fought out in the regulatory arena, complete with relatively narrow and conflicting private interests, an intermediate level of authority and discretion for both agencies and congressional committees, and generally uncertain results. Politicians hate uncertainty, so where a politically acceptable compromise can be fashioned, as seems to have been done on the issues of buffers, grazing, and release language, that compromise is likely to be utilized again and again.

So long as allocation overshadows management and the politics is regulatory, management direction will be treated as negotiable, and the concept of wilderness as a distinctive status with clear management principles will continue to erode. This could go on forever. One can imagine a future of arguing about increasingly small roadless tracts or even a future of arguing about which wilderness areas ought to be disestablished and put to more productive use.

On the other hand, allocation battles might come to an end sometime in the 21st century. One can imagine a future where all the de facto wilderness is protected, the country has pretty well accepted the status quo as legitimate, and allocation battles no longer overshadow management. Still, the wilderness policy process would probably remain within the regulatory arena. Increased demand for wilderness use seems certain, and without developers as their natural enemies, wilderness proponents might well fragment into conflicting user groups--backpackers versus horsemen or outfitters versus independents--with no one group able to dominate.

As long as the issues of wilderness are settled in the regulatory arena, they will be settled politically. Wilderness managers and the agencies for whom they work will have to compete with other interested parties to determine management direction. The agencies' greatest asset in that competition will be the professional credibility associated, on the one hand, with scientific expertise in wilderness resource management and, on the other, with political expertise in the human resource management of public participation and citizen involvement. In the long run, the land management agencies will maximize their influence in regulatory politics by developing, encouraging, rewarding, and relying upon that expertise.

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ENDNOTES

1. In recent years a common complaint from members of authorizing committees has been that their authority is being undermined by the imperialistic practices of the appropriations committees.

2. For the purposes of this paper I conclude the laissez-faire period with the 95th Congress and begin the interventionist period with the 96th Congress.

3. A total of 136 wilderness-related statutes were examined for this paper. Five appropriations measures are discussed in the following section. Statutes passed in the 101st Congress are excluded from the analysis because the rhythm of the Congressional cycle renders unreliable data based on temporal units of analysis shorter than one Congress (2 years). Congress passed only three wilderness-related, non-appropriations statutes between January 1, 1989, and March 1, 1990. Public Law 101-85 and Public Law 101-184 were commemorative. The first celebrated the twenty-fifth anniversary of the Wilderness Act; the second renamed the Copperas Vista, overlooking the Gila Wilderness, for Senator Clinton P. Anderson. The only substantive measure, the Nevada Wilderness Protection Act of 1989 (Public Law 101-195), further supports the conclusions of this paper.

4. In determining the number of SMPs per statute, I have relied on abstracting by Browning, Hendee, and Roggenbuck for the 103 wilderness laws reported by them (1988). I have endeavored to produce a comparable result in abstracting the remaining laws.

5. I have two caveats. First, whether a Special Management Provision is discretion-enhancing or discretion-reducing is unrelated to whether it constitutes good wilderness management by any substantive definition. My focus here is on the degree of latitude Congress grants managers. That latitude might be exercised for good or ill. Second, there is no necessary relationship between the degree of administrative discretion and the level of administrator happiness. Managers don't necessarily strive to maximize their discretion. Indeed, a hard-pressed field manager may find some protection in being able to say, "Congress made me do it."

6. Section 3 of the Wilderness Act required the Agriculture secretary to conduct wilderness suitability reviews of the primitive and contiguous areas and mandated a similar review by the Interior secretary for substantial roadless areas in the national park and national wildlife refuge systems.

7. The Forest Service generally interpreted the Wilderness Act to preclude admission of any area that presently violated the management standards established by Section 4. By contrast the wilderness lobby argued that admissions criteria were established exclusively by Section 2(c). See Costley, 1972; Foote, 1973; and more generally Allin, 1982. The purity policy had a long history in the Forest Service. For half a century following the establishment of primitive areas in the national forests, a policy of excluding the kinds of intensive recreational development popular in the national parks served to protect Forest Service wilderness from conversion into parks (Allin 1987).

8. Since 1977, administrative indifference has effectively neutered the PSD requirements of the Clean Air Act Amendments as they apply to national parks and wilderness areas.

9. See Public Laws 94-199 and 95-495.

10. See Public Law 95495.

11. See Public Laws 92-400, 93-622, 94-199, and 95-495.

12. Section 10(b) of the Wild and Scenic Rivers Act provided that "in cases of conflict between [the Wilderness Act and the Wild and Scenic Rivers Act] the more restrictive provisions shall apply" (82 Stat. 916).

13. See Public Laws 96-560, 98-328, 98-339, 98-406, 98-428, 98-508, 98-550, 98-585, 98-586, 100-184, 100-326, 100-499, 100-668, and 101-195.

14. See Public Laws 98406, 98428, 98-550, 99-504, 100-225, and 101-195.

15. See Public Laws 96-312 and 98-425.

16. See Public Laws 96-312, 98425, 98-430, and 98-550.

17. See Public Laws 97-384 and 100-225.

18. See Public Laws 96-312, 96476, 96-560, 98-406, 98-425, 98-428, 98-550, and 98-603.

19. See Public Laws 98-473, 100-203, and 100446.

20. For the purposes of this paper, wilderness oversight hearings are all those involving general wilderness policy except those where specific legislation is being considered.

21. Lowi's original work has been elaborated extensively in the public policy literature. See especially Lowi, 1972; Salisbury, 1968; and Ripley and Franklin, 1987.

22. In the real world of politics, paradigmatic shifts--such as the one from descriptive to regulatory politics--are more likely to be evolutionary than revolutionary. No bright line marks the end of one period and the beginning of the next, and it is a simple matter to detect elements of regulatory politics in the early period or elements of distributive politics in the current period. Still, the heuristic value of specifying the periods is clear, and the Central Idaho, Alaska, New Mexico, and Colorado wilderness acts all suggest that a new era commenced in 1980.

UNTRAMMELED BY MAN: PRESERVING DIVERSITY THROUGH WILDERNESS

H. Ken Cordell and Patrick C. Reed'

ABSTRACT

The most basic value of wilderness is its capacity to preserve nature. In this paper we examine why it is important to preserve nature through wilderness, what it is ***and how wilderness preserves, trends, and why it is so critical for our nation.***

INTRODUCTION

Words such as preservation and wilderness seem to evoke emotional feelings. They are value laden words which are difficult to discuss objectively. When wilderness and preservation are discussed, one of the sources of emotion is the thought that both deny opportunities for growth and commercial profit. For others, the words trigger thoughts of the untouched, of the mysterious, and of wonderment about natural things that have existed for millions of years. Too often, perhaps, resource management deals only from an emotional basis. That is why we are discussing wilderness values at this conference. We need to move beyond emotion as a basis for resource management decisions. To do so, a better understanding of the full spectrum of wilderness values is needed.

VALUE PERSPECTIVES

Preservation is intrinsic to the nature and value of wilderness. There are three basic types of value stances from which to view wilderness preservation. The first of these focuses on individual wants and feelings. People often join groups to support various causes they personally think are important or for which they intend to take an activist role. Often such involvement is done primarily, but not solely, for personal benefit. Sometimes, people join just to feel they are a part of something. Thus, one value perspective is that of personal benefit or value.

A second value perspective focuses on general concern for human welfare, survival, or simply enjoyment. In the past this has been a primary reason for preserving wilderness--to benefit humans alone. In particular, an emphasis has been on recreational uses of wilderness. We may also be concerned about our, and future generations having clean water and air. Almost exclusively we center our attention on humans and facilitating our consumptive lifestyles, satisfactions and comfort when we view the world from the human welfare perspective.

Wilderness provides an ecological safety net or a margin of error giving us a buffer against what we do on the other 96 percent of the nation's surface.

However, there is a third value perspective that is a little more difficult to grasp. It focuses on universal rights which recognize the right of all beings, living or not, human or not, to exist without human exploitation, molestation, or disturbance. It considers equity, or at least some form of rights for all to exist and to be free. This is a difficult concept, but we should consider universal rights, along with the individual and general human welfare value perspectives as we examine the overall preservation value of wilderness.

THE FORCES OF CHANGE

From any of the above value perspectives, preservation seems to be gaining appeal. Much of this appeal reflects a reaction to accelerating rates of

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environmental change, particularly "bad" change. Preservation implies cessation of change. Surrounding wilderness and the other things that we have chosen to protect, there are several rapid and accelerating forces of change.

The preservation capacity of wilderness represents an emerging national environmental ethic. It recognizes the rights or interests of all beings.

Population Growth and Extinction

In 1988, the global population was a little over 5 billion people. By the year 2000 it is projected to be 6.2 billion people. By the year 2020, we may be coexisting with over 8 billion people. One may wonder where all these additional human beings will live. This growth represents a 60 percent increase in just over 30 years. When considered relative to how long humans have been on the face of the earth, this growth is phenomenal. The less developed countries are growing fastest, currently contributing 3.9 billion and growing to almost 7 billion people by the year 2020. Even in the United States we are expecting about a 60 percent growth from 250 to about 400 million people by 2020.

The growth in the human population throughout the world is predominately responsible for environmental changes occurring today, including habitat losses, global warming and tropical deforestation. It is unimaginable that there is a loss of about 150 acres of tropical rainforest per minute. This is about 216,000 acres per day, or 77 million acres per year.

Species Extinction

Most believe that we are currently in a period of the greatest rate of species extinction to have occurred in last 66 million years. One species is lost every 15 minutes. It is estimated that one million species may be lost in the next 25 years. The loss of tropical forests is estimated to result in the extinction of about 1,000 species per year. Seventy-two percent of the species on United States islands are estimated to already be gone. 150,000 to 500,000 species may be lost in Central and South America if the rate of tropical deforestation continues unabated for the next 25 years.

Wildland Losses

In 1492, there were 2.4 billion acres of **roadless** lands in the area now defined by U.S. borders. By 1987 it was estimated that there were only about 200 million acres of remote, or very remote lands left. This means that just over eight percent of previously undisturbed lands are left; the rest were sacrificed to the human consumer and our passion for cars and highways, air and ocean travel, houses, commercial development, minerals, cheap energy, unlimited water and second and even third homes.

Wetlands in the United States provide another example of poor **wildland** preservation. **Almost** half of the United States wetlands have been lost in the last 200 years. Of these acres, 11 million were lost between the 1950s and the 1970s. As recent estimates showed the rate of loss was somewhere between 350,000 to 450,000 acres per year in the 1990s. Our current Administration has a policy of no-net-loss of wetlands, but the test of time will indicate the effectiveness of that policy.
The effects of spiraling consumer demand extend past our national boundaries. It is estimated that 55 square feet of Central American forest is converted to sustaining domestic cattle for each hamburger that is consumed from Central American cattle.

The above points are raised for consideration because these forces translate into massive changes to the natural environment, both in the United States and in other countries. Some, or maybe all of us, feel that change is not necessarily always good and that some places should not be forced to submit to the unrestricted will of humanity. Wilderness offers one opportunity to rationally deal with such change, In wilderness, nature dominates; nature is the principle **orchestrator** of change.

PRESERVATION THROUGH WILDERNESS

In the remainder of this paper we look at the full dimension of the preservation by examining three questions. First, "Why should we be interested in the capacity of wilderness to preserve?" Next, "What exactly is it that we wish to preserve?" Finally, "What are the trends in wilderness preservation values?"

Why Preserve?

The political system of the United States made the social decision that it is important to protect wilderness and that we will in fact do it. In passing the Wilderness Act, Congress decided we should not modify all areas within the United States and its possessions, that we should leave some "lands

designated for preservation and protection in their natural conditions." The Act declared it to be "the policy of the Congress to secure for the American people of present and future generations the benefits of an enduring resource of wilderness." There is no other system or opportunity in the United States that is capable of duplicating that kind of mandate and responsibility. The Act further requires that wilderness be administered in such manner that it will leave the natural systems thus encompassed unimpaired for future use and enjoyment as wilderness. The Act defines wilderness as an area where the earth and community alike are untrammeled by man. No one knows how much, when, where, or how the wilderness system will fulfill its destiny, but it has been decided that will happen.

From the standpoint of the value perspectives discussed earlier, there are other reasons. Preserved wilderness provides many benefits for all of society. Human welfare and quality of life are enhanced, our economy is stabilized, and personal well-being and even continued survival of the human species are better ensured. Wilderness provides an ecological safety net or a margin of error giving us a buffer against what we do on the other 96 percent of the nation's surface. There is also the ethical, or rights issue related to why many people view preservation as a reason for wilderness. The preservation capacity of wilderness represents an emerging national environmental ethic. It recognizes the rights or interests of all beings.,

What Is Preserved?

What is it that wilderness preserves? There are three principle categories of attributes that are preserved through wilderness designation including biological, cultural, and scenic attributes. We will emphasize mostly the biological attributes simply because others at this conference are dealing with the other two.

Biodiversity is a biological concept of much concern today. It refers to variety and variability among living organisms and the ecological processes within which they occur. Biodiversity typically refers to individual, species, and ecosystem levels. Preserved wildlands promote individual diversity because the infinite variety of conditions in nature stimulate and "reward" uniqueness and individual adaptability. Diversity of individuals strengthens the probability of species survival, unlike the human practice of monoculture.

Wilderness also preserves species and thus natural genetic diversity. In particular wilderness provides a space for threatened and endangered species to survive. More than one-half of current wilderness areas protect one or more federal or state listed species that are classified as threatened and/or endangered. It is equally as important though that wilderness contributes to protection of nonthreatened plant species genetic diversity, through natural regulation of age, sex, and numbers as it is protects animals.

Along with protection of the numbers of species of plants and animals in wilderness, there is a free and dynamic operation of natural processes that enhances biodiversity, rather than controls and selects only a special few that humans hold in high esteem. Wilderness enables natural processes to direct the destiny of all species in an equitable, balanced and unselfish manner. Fire, drought, disease, predation, flooding, and geological change are among the natural forces at work in wilderness.

Although not all types of habitats are a simple function of size, the fact that wilderness is often very large in size and that there usually is an extensive network of associated undesignated public lands, has some advantages for protection of ecosystem biological diversity. As of 1987, about 160 of the nation's 261 basic ecosystems were represented in our National Wilderness Preservation System. There are some estimates indicating if the system grows as some predict, there may be as many as 200 of 261 U.S. ecosystems ultimately represented. Preserving the diversity of ecosystems may in the long run be a more complex challenge than that of preserving individual or species biodiversity.

Cultural values are also preserved and protected by wilderness. Wilderness is a part of our culture and heritage that, if lost, can never be restored. The scientific information that can be gained through examination of historic and prehistoric evidences of earlier human existence and how humans lived with their environment is very important. We can also learn how ancient humans managed or mismanaged, survived or did not survive within their environments.

A final category of the values preserved in wilderness includes scenic resources. Preservation of wilderness provides protection of mountains, valleys, canyons, prairies, and coastal areas. All of these are vistas, or view scapes essential as backdrops drawing recreationists and tourists. The often spectacular vistas provided by wilderness may have high commercial value for use in magazines, films and mass media television and as backgrounds for drama, commercials and other promotions. Scenic preservation is often overlooked as one of the major values of preservation because we are often

more concerned with the on-site recreational uses of wilderness.

Preservation Trends?

Looking forward, what is the trend in wilderness preservation? With more than 100 million additional acres eligible for wilderness designation, it is improbable that the National Wilderness Preservation System will not grow. In fact, we know that it will. However, it could reach its maximum by the end of this decade, depending upon political negotiations, and how effective groups such as the Wilderness Society are.

What might be expected in the future? No one can be sure, but two of things are possible, even probable. One is that in completing the National Wilderness Preservation System, biodiversity and ecosystem representation might be more explicitly regarded as goals of the wilderness system. This would require better cooperation among many different groups and wilderness interests. Getting full representation will require cooperation among federal, state, and local governments and the private sector because the federal government does not control or own all of the 261 U.S. ecosystems. If biodiversity and ecosystem representation become more explicit goals, there will be a need to examine and identify which areas should be added to the System in order to round out ecosystem representation. There will also be a need to determine what size and distribution of acreage will be required to complete the effective preservation of areas, species, habitats and buffer necessary to engender truly natural processes, if such is still possible.

The second thing that may happen to shape future trends of preservation is explicit recognition or specification of preservation values in legislation to designate specific wilderness areas. There is a trend toward increasing specificity in wilderness legislation. Much of this centers on air quality, watersheds, and cultural resources, but more in the future may center on preservation values and targets. This will likely be complex because the full scope of preservation values is not yet well understood and because standards or measures of resource change acceptable for preservation are not yet available. This will call for an intensive research effort on the benefits of preservation as a non-recreational value of wilderness.

CONCLUSION

Let us briefly revisit the value basis for considering preservation. Personal, human welfare, and universal rights relate to the three logical perspectives for looking at the preservation value of wilderness. From any of these perspectives, the focus is on who receives wilderness benefits. From a self-interest (or personal) perspective, individuals hold existence, bequest and option values of wilderness preservation. It has been estimated that these self interest values may range upwards of $300 to $450 per acre. Additionally, the concept of wilderness is intellectually stimulating to individuals.

From an altruistic, or human welfare perspective, preservation benefits flow to people cross-culturally, as well as cross-generationally. Finally, from a universal rights perspective, all beings benefit without regard to place, time, status, state of matter, or species. Recognition of the value basis from which the merits, or lack thereof, of wilderness preservation is perceived can greatly improve collective consideration of it. Ultimately, there must be agreement upon a mutually acceptable value basis. There does not yet seem to be such agreement and thus a true wilderness philosophy continues to evolve as we move into the next century. If we evolve through the personal, to the human welfare, to universal motives or perspectives, the importance of the preservation value of wilderness will assume a higher profile.

THE ROLE OF SCIENCE IN WILDERNESS MANAGEMENT

John D. Peine'

THE VALUE OF SCIENCE AND WILDERNESS

One of the greatest benefits of wilderness, beyond the intrinsic value of protecting the future of natural ecosystems (which should be a global right among species with which we share the planet), is that associated with science. Large-scale protected areas provide an opportunity to explore and expand our knowledge base concerning how natural processes function. It is important to know the geophysical relationships of hydrologic and nutrient cycling. The unending intricacies of population dynamics as they relate to habitat in the context of community structures is extremely complex and important to understand. The natural history of species of special interest in the context of a natural setting is important as well. The enumerable synergistic relationships among organisms and habitat conditions represent the delicate balance that makes up the web of life. Discovering the intricacies of these relationships provides challenges for scientists in future decades, and probably centuries to come.

The most poignant social value of the utilization of science in wilderness areas is that it provides some reference point for assessing the impact of man on our precious Planet Earth.

The mere identification and description of the biological diversity in these natural landscapes is of utmost importance to man. Stories appear in news media almost weekly about how entire ecosystems are lost before the organisms are even described by science, let alone explored as to their role and function in the environment. Resolution of the dynamics within species at the genetic level is also extremely important in order to interpret the relationships of organisms within the landscape and their adaptation potential. This level of ignorance that we all share could be likened to that of an alien coming onto this planet and identifying Homo sapiens but not noticing the differences among races and not realizing that a disease might be ravaging some races more than others, thereby selectively eliminating genetic variability that evolved on the various continents. Such a perspective would seem quite ignorant to us. But if we, as Homo sapiens, consider our level of understanding of soil nematodes, for instance, that is basically the state that we are in. This situation might suggest that the nematodes of the world should rise up and be counted. These organisms are in a critical position in the food chain, playing a crucial role in the natural world. Possibly, nematodes should attempt to march on Washington and demand their equal rights, but it would probably take a long time for them to fall in line, let alone make the trip.

Possibly the value of science in wilderness areas that man can best relate to, unfortunately, is that associated with utilization of science to discover how these organisms in their natural environment can be used to serve him. Pharmaceutical applications of organisms, for instance, are yet to be fully exploited. This is one of the arguments that you hear time and again as to why we should preserve natural populations. There might be cures for diseases in some of the chemical compounds yet to be discovered and tested. Other direct benefits to man include genetic resources for replenishment of wildlife species in surrounding areas; supply of high quality water benefiting groundwater and river courses; and, of course, the social and spiritual values that relate to either knowing that these areas have been protected or actually having the privilege

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of experiencing them firsthand. Science can help to define the magnitude of these values.

The most poignant social value of the utilization of science in wilderness areas is that it provides some reference point for assessing the impact of man on our precious Planet Earth. Wilderness areas in the next century may be the only places where one can establish that point of reference, and even that potential is in serious jeopardy due to the effect of outside influences on these natural landscapes.

APPROPRIATE DIMENSIONS OF SCIENCE IN THE WILDERNESS SETTING

Thanks to modem-day technology, there is an enormous wealth of information available globally at the landscape level which can be utilized to describe broad categories of biogeographic descriptions in wilderness areas. This information provides a foundation for a science program. Thematic mapper data via satellite provide an opportunity to discern vegetation patterns, water systems, exposed bedrock, and manmade facilities. Topographic features can be precisely defined from digitized topographic data from the U.S. Geological Survey. The quantification of these parameters at the 80-meter or 30-meter pixel level provides an enormous amount of information concerning various features that can be distinguished. Time sequence imagery of these computer-generated scenes is an extremely powerful way to establish large-scale changes that can occur in wilderness, such as defoliation from insect infestation, or the loss of vigor of some species due to change in hydrologic conditions or soil nutrient availability. The delineation of these landscape descriptors is an important first step in introducing a science program to a wilderness landscape.

The next consideration is to incorporate the concepts that are evolving in the relatively newly established field of landscape ecology. It is important to incorporate these concepts when designing a system of research sites within a wilderness area. Figure 1 shows a complex series of relationships that interact in creating a landscape pattern of organisms that occur in a natural environment. Diagram component D of Figure 1 shows the scale dynamics of forest type patterns which occur on a landscape over space and time. For the old-growth broadleaf forests of Great Smoky Mountains National Park (GSMNP), the species composition is largely driven by gap dynamics that occur when whole trees relinquish their place in the canopy, creating opportunities for understory trees to compete with each other for utilization of that canopy space. The processes underlying these forest patterns are depicted in quadrant B of Figure 1. Quadrant C lists various spatial and temporal environmental constraints that relate to the positioning of community populations on the landscape. All of these components are interrelated, and the nature of these interrelationships, as subtle as they may be, are of fundamental importance in driving the ecosystem processes. Last, but not least important, are the types of disturbance that can affect natural ecosystem processes, which are defined in quadrant A of Figure 1. These disturbance factors depicted in Figure 1 relate only to natural forces, but in most natural areas the hand of man has had significant influence on natural ecosystems via activities associated with fire, logging, grazing, settlement, air pollution, and the introduction of non-native species. All told, these dynamics are extremely difficult to sort out, yet without keeping a clear focus as to their interactive relationships, it is very difficult to interpret the dynamics of these wilderness landscapes.

It is very important to evaluate ecosystem processes that are taking place within the context of this landscape ecology scenario. Figure 2 indicates a stylized hydrologic cycle requiring definition in order to understand how natural ecosystems work. Understanding the hydrologic and nutrient cycling associated with the natural landscape provides a means to summarily evaluate the overall functioning of the system in a composite sense. Unfortunately, understanding hydrologic systems and nutrient cycling in itself does not really explain the dynamics of the biology on the landscape. Too often, studies are done where there is an imbalance among components of ecosystem level studies and, more often than not, it is the biological components of the study of terrestrial and aquatic systems that tend to be under-represented.

It is also important in natural landscapes such as wilderness areas to study specific community dynamics. This can range from simple studies of presence and absence to mortality reproduction, total biomass, and positioning on the landscape. The study of guilds among populations is an instructive way to focus on community relationships of various species in association with habitat.

Species of concern to focus on are those serving as bioindicators of change associated with natural processes or perturbations. Heroic species which may symbolize wilderness are also frequently subjects of research. Populations of species that are frequently poached from the landscape should be monitored. Rare and endangered species or those threatened by impact of exotic insect infestation or disease, or air pollution should be the focus of study as well.

Last but not least, a social science program should be a major component of study in a wilderness

Figure 1. (a) Disturbance regimes, (b) forest processes, (c) environmental constraints, and (d) vegetation patterns, viewed in the context of space-time domains. Modified from Delcourt and others. (1983) Copyright BioScience Feb. 1987, Vol. 37 No.2.

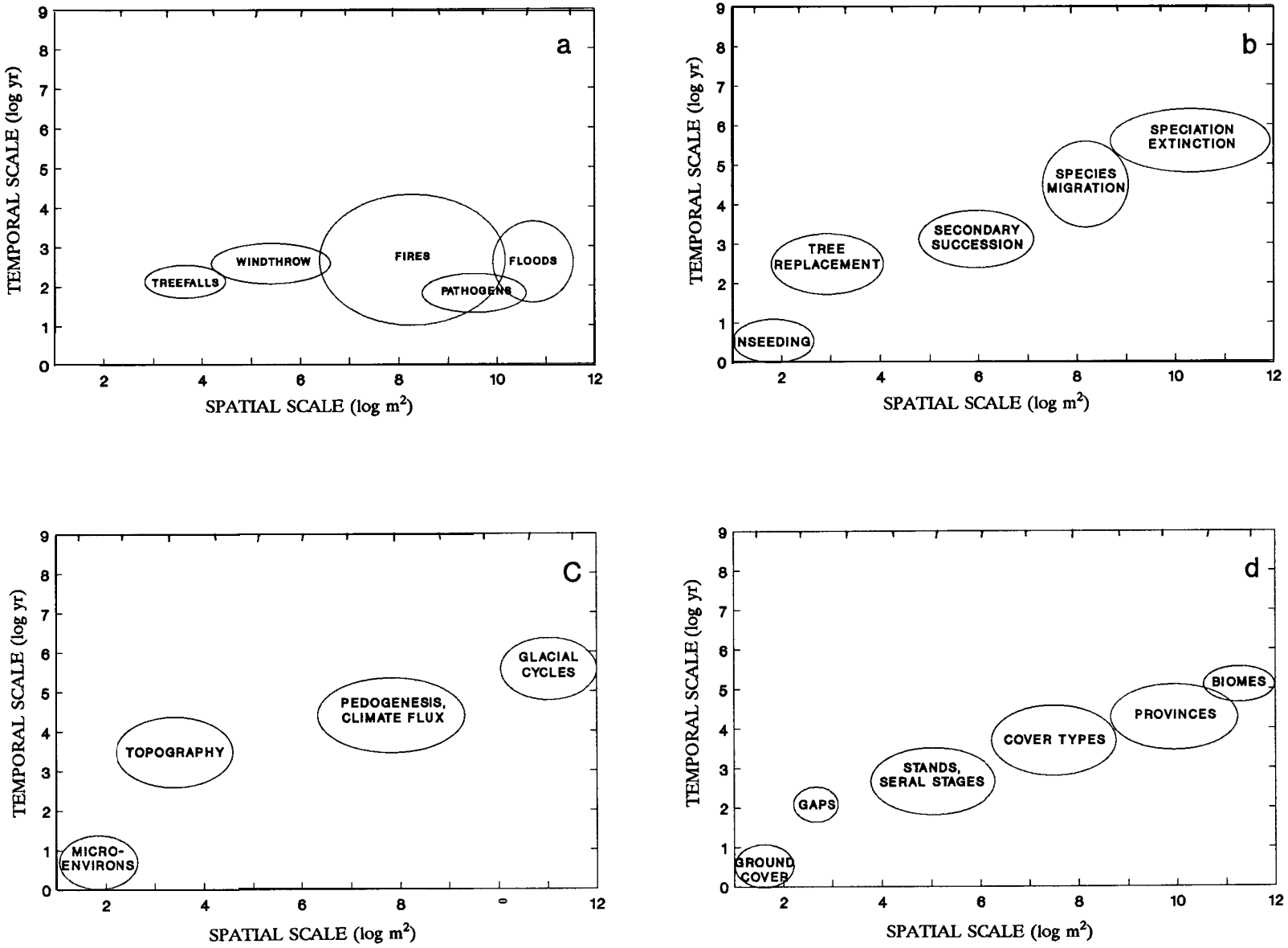
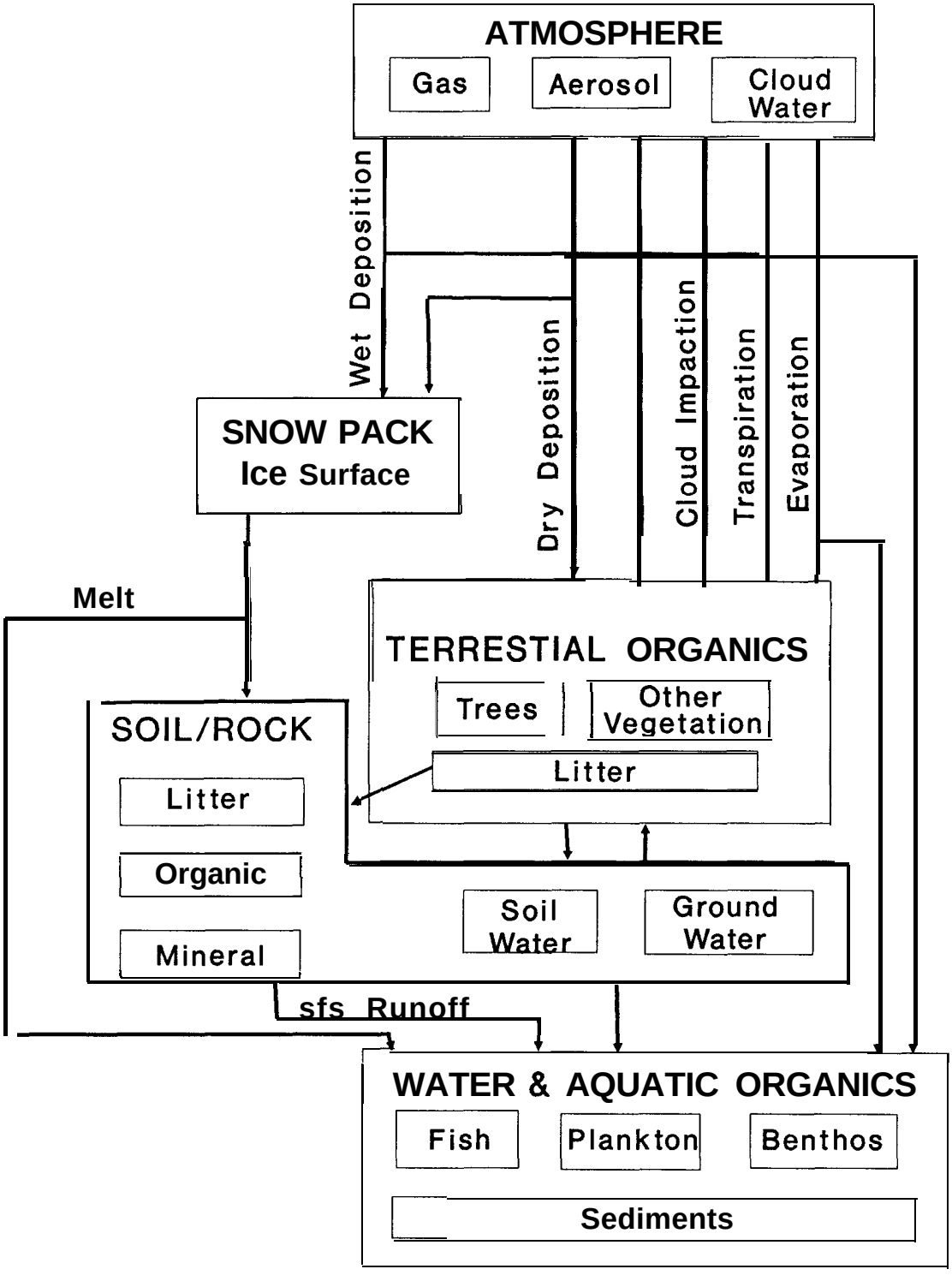


Figure 2. A simplified stylized reservoir and transport diagram of an ecosystem with special attention toward atmospheric deposition inputs.



setting. This research might be the most important of all because it will provide an opportunity to establish the social value of wilderness for people well in advance of the time when the demand for diminishing resources will expand enormously under political pressure to exploit those resources protected today by the wilderness systems. It is important to devise a means to quantify social values of wilderness in a rapidly changing society. For example, is the opportunity to experience solitude in wilderness areas being lost, or is the definition of solitude shifting?

It is also important to establish the patterns of human behavior in wilderness areas, both from legitimate recreational pursuits as well as illicit activities such as the illegal taking of plants and animals. Such studies should be closely associated with studies assessing the ecological impact of such behavior. Much research has been done in this arena, but managers have yet to establish systematic means to evaluate these impacts on a system-wide level.

It is difficult to imagine today just how extreme those pressures might become within the next 50 to 100 years to exploit resources protected by wilderness designation, but it is guaranteed that the pressures for exploitation of the wilderness system will make those currently associated with oil exploration on the wildlife refuge in Alaska seem like tame politics. Science might provide the best defense against these pressures for exploitation.

EXAMPLE OF THE APPLICATIONS OF SCIENCE TO WILDERNESS MANAGEMENT

The 208,000-ha Great Smoky Mountains National Park, the nation's most visited national park, is being managed as wilderness pending passage of wilderness designation by the U.S. Congress. The park has been a focal point for research for several decades and is one of the few with a field research laboratory site. The close association of science and management in this park provides a variety of examples of how science can serve management decisions that relate to wilderness areas.

Biological Diversity

The long term focal point of the research program in the park has been to document the biological diversity of the landscape. Satellite imagery has been utilized to produce a vegetation map for the park. A disturbance history map has been assembled for the park, including settlement, logging, fire, and agriculture. A natural heritage data base utilizing the program of the Nature Conservancy has been established in the park. This was the first park in the system to do so. A rare plant mapping program has been ongoing for a long period. Ecosystem monitoring has been established for the high elevation spruce-fir with six permanent vegetation plots and high elevation stream chemistry monitoring. The effect of all this activity is to utilize science to answer the question, "What is the biological diversity of the ecosystems represented by this designated wilderness landscape, and how will it be changing over time?"

As we anticipate the decade of the 1990s and approach the next century, it has become more and more apparent that science is not a luxury but a mandatory tool for managers with the awesome responsibility of sustaining the wilderness values in this country which are held in such high regard.

Fire Ecology

Although a relatively small amount of fire ecology research has been done in the eastern deciduous forests, a variety of projects have been initiated in GSMNP to evaluate fire history. A compilation has been made of all fires that have occurred in the park in this century and has been entered in the park's geographic information system. This data base of fire location, intensity, and duration provides fundamental information of how fire has impacted the landscape in this century. Permanent vegetation plots have been established in some of these areas to ascertain the successional stages of plant communities following fire of various duration and site conditions. A limited amount of data has been collected from sediment cores to evaluate the presence of carbon indicating prehistory fire frequency. A recent vegetation map of the park generated from satellite imagery discloses the extent of a distinctive pine-oak forest type in the northwest quadrant of the park which represents a remnant of longstanding fire occurrence. In addition, fire dependent species have been identified in the park, and rare and endangered species that might be threatened by fire are also currently being mapped. Fuel loading research has been done in high elevation forests that have experienced a high degree of dieback due to mortality from insect infestation. All these factors provide critical information in

making the always difficult decision concerning whether or not to let a fire burn that has been naturally set in the park. Expansion of the research program in this subject area in the future will provide more precise information on the ramifications of alternative policies associated with fire so managers might make the best informed decisions in a timely manner. Deciding whether or not to let fire burn is the managers' most significant prerogative concerning impact on nature ecosystems processes in the wilderness setting. Science benefits wilderness by helping to answer the question, "To burn or not to burn?"

Gypsy Moth

There has been a great body of research compiled concerning the gypsy moth as it moves methodically down the Southern Appalachian Mountain range. Research in the park has been focused on establishing a more complete species list of lepidoptera. This provides better understanding of the potential loss of nontarget species impacted by spraying to control the gypsy moth population. The policy of the park currently is to allow the gypsy moth infestation to take its course except around public areas where adverse impact on the quality of the visitor experience might occur. GSMNP research being planned is to describe biological communities that are likely to be impacted by gypsy moth defoliation. Science benefits wilderness by helping to answer the question, "To spray or not to spray?"

European Wild Boar

Extensive research has been conducted on this exotic species over the last 15 years. Initial studies concentrated on the biology of the animals and their movement patterns and preferred food items. Studies then focused on the adverse impacts from these animals to soils, plants, and animals. Research has also focused on evaluating means to more effectively remove the animals from the park through the testing of enhancement of baits that are used in trapping. Most recently a population model has been developed. This will aid management by predicting the impact on the population from control activities, mast production, and climatic conditions. Science benefits wilderness by helping to answer the questions: " Why remove these animals?" "Where to remove these animals?" and "How to remove these animals?"

Air Pollution

The primary focus of research in the park during the 1980s was to monitor the level of air pollution to measure the degree and nature of deposition impacts associated with that pollution. Studies have indicated that there is a significant amount of pollution in the atmosphere that reaches the park and that an extremely high level of deposition occurs, particularly in the form of deposition of nitrates and sulfates in the high elevation forests. Pollution loading in the park is shown to be greater than anywhere else in the country, including New England where similar protocols have been followed to monitor such deposition. These mountaintops seem to be ideal for filtering this pollution out of the atmosphere due to their steep slope, high elevation, and the physical features of the needles of the co-dominant spruce and fir trees. Some of the highest pollution deposition occurs when the mountains are enshrouded by clouds that carry heavy loading of pollutants. Adverse effects from pollutants that have been observed include foliar injury from ozone, probable losses of soil nutrients such as magnesium and calcium due to the influx of pollution, and the degradation of visibility which directly impacts the quality of the visitor experience. This phenomenon of regional haze and buildup of air pollution obscuring views tends to occur at the peak of the visitor season. Significant decline of the red spruce trees has been identified and attributed, at least in part, to this pollution loading.

This research program has influenced the current debate in Congress concerning the development of more stringent standards for air pollution. The program has also influenced the issuance of permits for new point sources of air pollution in the Southern Appalachian region. Plans for construction of an incinerator in Knoxville were put on hold due in part to concerns about potential adverse effects by the project on the park's natural resources. Science benefits wilderness by helping to answer the question, "Do we need tighter air pollution control standards to protect wilderness values?"

Disease Control

Studies have been initiated to evaluate the extent of dogwood anthracnose in the park. An estimate of the distribution of dogwood has been made through aerial photography during periods of bloom prior to leafout, and an assessment of the progression of the disease via the installation of a series of permanent plots within selected stands is underway. Tentative plans are to control disease progression in certain areas to preserve the gene pool represented by the dogwood in the park and to evaluate the practicality of potential treatments. In this case, science is benefiting wilderness by helping to answer the question, "How serious is the disease problem and are there currently any practical control mechanisms that can be utilized in a wilderness setting?"

Visitor Satisfaction

Field surveys of backpackers were conducted in 1983, 1986 and 1989 which, among other things, evaluated visitor satisfaction with various management practices in the wilderness area and satisfaction with the quality of visitor experience there. Research documented an increase in public concern about the condition of the shelters and the presence of litter in the backcountry. This trend is consistent with a declining active management role in the backcountry of the park. Also, a mechanism has been developed through science to monitor satisfaction levels with the quality of visitor experience in the backcountry over the long term. Science has benefited wilderness by helping to answer the question, "Do we need to limit overnight use in the wilderness area in order to minimize adverse impact on the resources and maintain a quality visitor experience?"

STRATEGY TO FACILITATE THE DEVELOPMENT OF AN ACTIVE SCIENCE PROGRAM IN A WILDERNESS SETTING

The following suggestions are offered to managers of wilderness areas who are interested in establishing an active science program in a wilderness setting.

1. Establish a center to coordinate research on the wilderness area, either at some entity associated with the managing agency or at a nearby university or research institution. This important coordinative function might be directed by the establishment of a resource advisory committee to provide counsel concerning research conducted at the wilderness area.

2. It is very important to provide facilities near the wilderness area for housing scientists and their technicians and space for field sample processing. Support for logistical matters is also valuable. It is surprising how even modest facilities can greatly reduce the overall cost of a field research effort.

3. It is important to establish research sites in wilderness areas and to manage them actively. These study sites are complementary to a landscape level perspective and should be nested in the scale and context of watershed, catchment, transect, and stand. Permanently marked study sites for terrestrial and aquatic ecosystems will provide scientists with an opportunity to contribute systematically to a growing knowledge base on ecosystem processes and community dynamics. The watershed level is most important for monitoring hydrology and water chemistry. A catchment level is an appropriate scale to utilize a series of permanent nested plots to evaluate various life forms in the same habitat condition. Specific permanent plots within these catchments can emulate the transects where a lesser degree of sampling is done to measure the variable and key parameters of intensively sampled catchments to evaluate their effectiveness across the watershed.

4. Utilize remote sensing and satellite technology to characterize the resources at a landscape scale. A wide variety of land cover types can be distinguished. A digitized elevation model can be generated from topographic maps. Watershed and stream courses of water bodies can be defined. All this information should be incorporated into a geographic information system. Other elements to incorporate into such a system at the landscape level include geology and, if appropriate, disturbance history.

5. The designated research center should coordinate research on the wilderness area and data management associated with archiving information collected from the various research projects on the area. Investigators working in the wilderness area should be encouraged to contribute to the growing body of knowledge so that it is available to other researchers with potential interest in the same site.

6. The research advisory committee should make a periodic synthesis of the research and articulate management implications from the research results. They should also periodically suggest the most productive directions for further study.

7. The agency responsible for managing the wilderness and the center for coordinating research should market effectively to conduct research in the area to the appropriate research community and suggest the kinds of studies that are most needed. Researchers at the center should coordinate the development of research proposals from outside funding sources to facilitate highest priority research.

Benefits from following this series of steps for fostering research in wilderness areas will provide significant insight for management of wilderness areas. It has become painfully obvious that the old adage, "Let nature takes its course" is not adequate in this world of the invasion of exotic species, air pollution, and the potential catastrophic global climate change. As we anticipate the decade of the 1990s and approach the next century, it has become more and more apparent that science is not a luxury but a mandatory tool for managers with the awesome responsibility of sustaining the wilderness values in this country which are held in such high regard.

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A POLITICAL TAXONOMY OF WILDERNESS BENEFITS

Glenn E. Haas*

Managing wilderness in the 21st century will require a much better understanding of the benefits that accrue from protecting this resource. The purpose of this paper is to respond to the basic questions posed by the conference steering committee: Why be concerned about wilderness benefits7 And, what are the benefits of wilderness?

The foundation of our philosophy towards wilderness is comprised of a system of personal values and beliefs. Increasing our awareness and knowledge of the benefits of preserving wilderness increases this system of personal values and beliefs.

WHY BENEFITS?

For the majority of wilderness enthusiasts, a question about the benefits of wilderness is viewed as elementary, almost silly. Yet it only takes one encounter with a challenging wilderness opponent to bring home the fact that our ability to professionally and intellectually discuss something so obvious to us is often superficial and even embarrassing. It is imperative that we begin to develop cogent explanations about the benefits of wilderness. Six reasons for this need are advanced.

Shape Philosophy/Ethic

The foundation of our philosophy towards wilderness is comprised of a system of personal values and beliefs. Increasing our awareness and knowledge of the benefits of preserving wilderness increases this system of personal values and beliefs. It adds richness and depth to this system which leads to increased confidence and credibility when discussing wilderness. These latter traits then enhance our ability to persuasively communicate--that is, to get people to agree or do what we would like them to do.

An understanding of wilderness benefits will lead to richer personal philosophies. As more and more people come to share similar philosophies, we will witness the evolution of a wilderness ethic in our society. This ethic will be the moral fabric or code of conduct for our society's preservation of wilderness--the most essential tool if our grandchildren are to benefit from wilderness in the 22nd century (Driver and others 1987).

Public Support

In a democratic government, the principle of consumer sovereignty is paramount. Public demand or support was essential in the passage of the 1964 Wilderness Act and will be essential in maintaining the integrity of the National Wilderness Preservation System. Being knowledgeable of the benefits of wilderness will lead to an informed, articulate citizenry. It also will lead to a citizenry that is more vocal and involved in public decision-making processes. As competition for shrinking resources and dollars intensifies, a participatory constituent on behalf of wilderness is essential.

Wilderness Professionalism

A very serious problem that must be solved in the 1990s relates to the fact that wilderness professionals must be trained, hired, and provided information (e.g. research literature) and. continuing education

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opporttmities. It is a travesty that most wildernesses are being managed by temporary, seasonal employees (Reed and others 1989; Vento 1990).

But what should a wilderness professional be educated in? Psychology? Sociology7 Communications? Economics7 Marketing? Interpretation? Recreation resources? Visitor behavior? Natural resource planning? Forestry? Wildlife? Water resources? Range resources? Biology? Ecology7 Atmospheric sciences? Occupational therapy?

Becoming knowledgeable of the benefits of wilderness will suggest subject matter areas and their relative emphasis. It also will substantiate the need for professional managers and skills that are necessary at different administrative levels. Relatedly, this knowledge will help to develop predictable career paths and credibility within agencies.

Management Decisions

Wilderness management is not easy, even now when our focus is almost solely on the recreation-related aspects of wilderness. The integration of other wilderness uses, and their subsequent benefits, into decision-making processes will further compound the difficulty. An integrated, holistic approach which reflects the diverse benefits of wilderness is needed in decisions of wilderness goals, objectives, quality standards, zoning, tools, techniques, and regulations.

At a more macro level, understanding the benefits of wilderness will help to assure a "system" of national wilderness areas. This will allow managers and the public to recognize the uniqueness of each wilderness as well as the diversity or richness of the National Wilderness Preservation System.

Budget/Personnel/Programs

Wilderness management requires money, professionals, and programs. Even after 25 years, the amount of resources being allocated to wilderness is minuscule. The reasons for this situation are many, ranging from the lack of wilderness professionalism to agency traditions and Congressional ignorance (U.S. General Accounting Office 1989).

Justifying wilderness resources based on some recreation metric has not and will not be adequate. We must develop a series of metrics, outputs, or targets that account for the multiple benefits of wilderness. More effective justifications can then be made for wilderness resources. This need is especially paramount if, and when, recreation use in wilderness begins to decline.

Designation/Declassification

The effectiveness of the argument for establishing a wilderness based upon the provision of "primitive and unconfined" recreation opportunities is losing its credibility. How many more acres of wilderness playground do we need?

It is personally difficult to say we need more wilderness for recreation purposes, yet one can easily argue for more acreage for the purposes of cultural, historical, educational, spiritual, scientific and future choice values (**Haas** and others 1986). An understanding of the benefits of wilderness will literally increase the size of the National Wilderness Preservation System and better equip us to refute efforts to declassify wildernesses or substantially amend the Wilderness Act.

The survivability of the National Wilderness Preservation System and similar land designations requires that a political taxonomy of wilderness benefits be developed.

WHAT BENEFITS?

The wilderness related literature over the past 30 years is rich with conceptual and empirical taxonomies related to the uses, values, or benefits of wilderness. These taxonomies have identified categories of benefits, ranging from several macro categories to micro categorizations involving 20 or more categories.

One of the reasons why multiple taxonomies (Driver and others 1987; **McCloskey** 1990) have evolved relates to the role the author had in mind. The taxonomies with only several categories have served to communicate with laypeople such as outdoor enthusiasts and environmental memberships. Other taxonomies have tended to serve the ecological community and have been useful in wilderness designation deliberations. The taxonomies with numerous categories have served to organize and link research and higher education programs. These are valid roles and valid taxonomies. Yet, a basic precept of this paper is that the National Wilderness Preservation System--those 92 million acres currently

designated--needs a political taxonomy of wilderness benefits.

Basis for Political Taxonomy

The creation of the National Wilderness Preservation System is a tribute to the principle of consumer sovereignty and the American political process. Likewise, the long-term continuance of the System will need a taxonomy to persuade the American public and political process.

Six criteria were considered in developing the proposed taxonomy of wilderness benefits presented in this paper:

1. Professional/Credible - the taxonomy must have integrity and be viewed as conceptually and scientifically valid;

2. Large Segment of Society - each category within the taxonomy must be relevant and understood by a large percentage of our adult society, particularly by affluent change-agents and decision makers;

3. KISS Principle - Keep It Simple Stupid is essential, particularly in deciding upon specific verbiage and the number of categories (i.e., less than eight);

4. In Vogue - select verbiage which is being used today--or will be used tomorrow--by nationally and internationally respected institutions or individuals (i.e., National Geographic, National Academy of Science, United Nations);

5, Politically Persuasive - capitalize on the direct and indirect linkages between wilderness and other popular and current issues or trends;

6. Emotion Laden - embrace the fact that the American public is frequently moved by its "heart" and that the taxonomy should be emotionally or affectively valid.

A Political Taxonomy

The taxonomy proposed here has five categories of wilderness benefits which can be graphically depicted as a pyramid (Figure 1). Four of the categories are represented by the base and sides of the pyramid and the fifth category is represented by the pinnacle. A discussion of each category follows.

Global Conservation Ethic

The National Wilderness Preservation System must be viewed as an integral part of an international family of natural or **wildland** designations. The system is not an island, but rather a global resource of equal status with World Heritage Sites, Man and the Biosphere Reserves, National Parks, Wildlife Refuges, and many others.

The presence of wilderness, as with other similar land designations, helps to stimulate environmental awareness, the need for balance and harmony between nature and human activity, attitudinal and behavioral changes among humans, and expansion of a global conservation ethic.

New Knowledge

People who doubt or have little concern for environmental problems in the world often point to the belief that technology, science, and new knowledge will be our salvation. Likewise, those people who believe there are serious environmental problems also point to the need to preserve the last vestiges of our world's natural ecosystems because of the "treasure" of knowledge they presumably contain. This category appeases both needs for new knowledge.

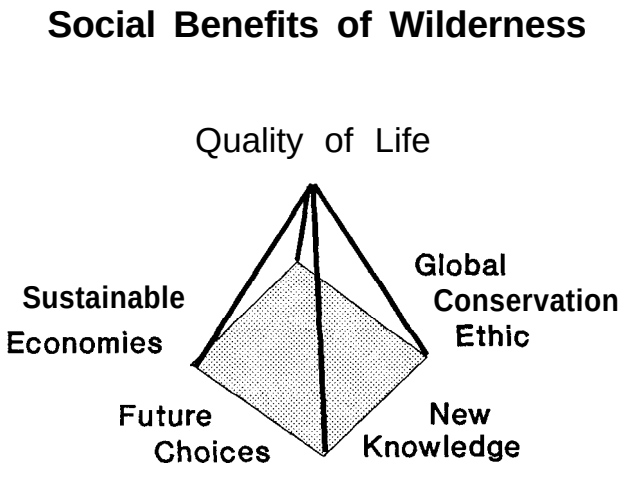
Many popularized benefits fit within this category. These may include such ideas as biological diversity, gene pools, ecological baselines, scientific laboratory, environmental and experiential education, personal self esteem/stress mediation/physical and mental challenge/enjoyment, cultural and heritage preservation, and spiritual introspection.

Future Choices

Choice is a fundamental precept of the American Constitution and future connotates improvement, betterment, and fulfilling our personal dreams. These are powerful words in our society.

The benefit of future choices includes such ideas as options, reversible decisions, and the ability to change our mind. Future choices embrace the concept that today we are borrowing our resources from our children and grandchildren. Wilderness provides us the ability to give our future generations choices, flexibility, options, and the opportunities to exploit, conserve, or preserve as they deem desirable.

Figure 1. The social benefits of wilderness.



Sustainable Economies

Significant attention is being given to the importance of developing and sustaining local, national, and international economies. Conceptual and empirical linkages appear to justify viewing wilderness as an economic resource (Peterson and others 1988). Wilderness may benefit economies from the standpoint of tourism expenditures, land values, attracting industry, tax bases, and direct consumption related to mining, grazing, and oil and gas extraction from wilderness.

The benefit of sustainable economies from wilderness in undeveloped and developing nations is even more defensible. Ecotourism, nature tourism, wildlife tourism, educational tourism, and scientific tourism are phrases that can be found in the international tourism industry and which are dependent on wilderness-type land designations.

Quality of Life

The fifth category which is viewed as the pinnacle of the pyramid is quality of life. While the phrase is nebulous, it connotates such ideas as human welfare, comfort, satisfaction, happiness, community pride, mental health, tranquility, prosperity, stability, and world peace. These, too, are powerful words which can be attributed to wilderness-type land designations.

SUMMARY

The survivability of the National Wilderness Preservation System and similar land designations requires that a political taxonomy of wilderness benefits be developed. The taxonomy must be persuasive in effecting changes such as increased budget/personnel/program allocations, increased agency professionalism, stronger environmental laws/policies/regulations that will protect the integrity of the System, and a global conservation ethic. This five-category taxonomy could provide cogent explanations about the benefits of wilderness and be used by interested publics, environmental groups, agencies, media, and Congress to effect these changes.

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PART III. Management of Wilderness for Nonrecreational Values and Uses

WHAT CAN WILDERNESS DO FOR BIODIVERSITY?

Reed F. Noss'

ABSTRACT

Biodiversity includes not only species, but also genes, communities, ecosystems, landscapes, regions, and biomes. Big wilderness, defined as very large, roadless, lightly managed areas, may better represent native biodiversity at more levels of organization than any other kind of protected area. At the genetic level, big wilderness supports multiple demes and heterozygosity and allelic diversity within demes. At the species level, viable populations of species ill-adapted to the humanized landscape are more likely to be maintained in big wilderness than in smaller areas. At the community or ecosystem level, the variety of habitats within big wilderness supports many different associations of species. Although each association might be protected separately in a system of smaller reserves, their functional combination at a higher level of organization is not protected. Only in large wilderness areas can native biodiversity be maintained at the landscape level, i.e., with *the* ***full spectrum of environmental gradients and habitats overlaid by mosaics of disturbance-recovery patches in approximate steady-state proportions. Today, only 5*** (2%) ***of 261 Bailey-Kuchler ecosystem types in the United States and Puerto Rico are represented in designated wilderness*** *in units* ***of 1*** *million ha or more, all* ***of these in Alaska. Only 50 (19%) of these ecosystem types are represented in units of at least 100,000 ha. Wilderness areas smaller than some critical size must be actively managed to subsidize natural disturbance regimes and augment populations of space-demanding species. Broad linkages between wilderness areas may not fully compensate for inadequate size, but may help smaller areas remain viable.***

INTRODUCTION

What can wilderness do for biodiversity? What can biodiversity do for wilderness? The relationship is reciprocal. Big wilderness, defined as very large, roadless, lightly managed areas (Foreman and Wolke 1989), can represent more levels of biological organization in better health than can smaller and more heavily modified areas. Biodiversity, as an environmental issue of enormous public and political interest, can infuse new vigor into the wilderness movement; provide scientifically valid justifications for protecting large, intact areas; and furnish ecologically meaningful criteria for wilderness area selection, design, and management. Although I agree in principle with the late Edward Abbey that "wilderness needs no defense, only more defenders," scientific selection and management criteria will help assure adequate representation and protection of biodiversity in wilderness and other public lands.

For native biodiversity at the landscape level of organization, which consists of gradients and mosaics of many community types, big wilderness is the only option. Wilderness and biodiversity need each other.

How useful are wilderness areas in the overall effort to protect biodiversity? In the conterminous 48 states, only about 1.8% of the land is designated wilderness; the figure is 4% if we include Alaska (Watkins 1989). Most of the Earth's terrestrial biodiversity will be maintained, generally through active management, in the "seminatural matrix" of multiple-use forest, range, and agricultural lands (Brown 1988). But for some species, those that do not get along well with humans and hence are often the most endangered, there is no substitute for big wilderness if they are to survive outside zoos. For native biodiversity at the landscape level of organization, which consists of gradients and mosaics of many community types, big wilderness is the only option. Wilderness and biodiversity need each other.

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In this paper, I explore the relationship between wilderness (designated and de facto) and biodiversity. First, I review recent concepts of biodiversity as encompassing multiple levels of biological organization, and discuss how wilderness areas contribute to conservation at each of these levels. Then, I discuss the importance of representation as a conservation criterion, and the role of big wilderness in representing the full spectrum of biodiversity. I define "big" as at least 100,000 ha, or 1 million ha or more for ecosystems subject to landscape-scale disturbances. The scientific values of wilderness include opportunities for basic research and the "benchmark" functions discussed by Aldo Leopold but virtually ignored in modem wilderness debates.

To the extent that a species is dependent on the conditions of wilderness, reductions in roadless area in a region predispose it to extinction.

LEVELS OF BIODIVERSITY

Many people still equate, biodiversity (short for biological diversity) with the number of species within a particular area. But the species is only one level of biological organization. Recent definitions of biodiversity converge on the view that biodiversity spans multiple levels of organization, from genes to biomes. The Office of Technology Assessment (1987) defined biological diversity as "the variety and variability among living organisms and the ecological complexes in which they occur," and discussed biodiversity at ecosystem, species, and genetic levels. The landscape level has been added by other authors (Noss 1990).

At any level of organization, numbers alone do not encompass conservation concerns about biodiversity. It is not some maximum diversity of species or vegetation types that we wish to see preserved within a wilderness area, but rather native species in naturally occurring patterns of abundance (Noss 1983; 1987a; Wilcove 1988). Composition, then, is just as important as richness. Franklin and others (1981) pointed out that ecosystems in general can be characterized by three primary attributes: composition, structure, and function. All three attributes determine the biodiversity of an area, and all three are ordered hierarchically (Noss 1990). A comprehensive wilderness protection strategy must seek to maintain all of this complexity.

The Genetic Level

Genetic diversity includes within- and between-deme components. Within demes (i.e., semi-isolated local populations), a common conservation goal is to maintain high levels of heterozygosity and allelic diversity. Small, isolated populations tend to become inbred and fixed for a single allele at a large proportion of their loci. If these alleles are harmful recessives, inbreeding depression (evidenced by loss of viability and fecundity) may become evident. Random fluctuations in gene frequencies (genetic drift) in small populations can result in the loss of alleles and reduced potential for future evolutionary adaptation. Hence, we can expect that many small, isolated nature reserves will contain genetically impoverished populations with a high probability of extinction (Frankel and Soul6 1981; Schonewald-Cox 1983).

Local populations respond through directional selection to differences in habitat conditions, and different alleles often are favored in different demes. A deme is most likely to be genetically distinct when it is disjunct or at the periphery of a species' range. There is a trade-off between maintaining genetic diversity within and between demes. Isolation promotes between-deme diversity, but typically reduces within-deme diversity. Allendorf (1983) suggested an ideal exchange among demes as one reproductively successful migrant individual per generation.

Large wilderness areas, especially when interconnected with other wilderness areas into regional networks, offer exemplary conditions for genetic conservation. If large enough (say, 1 million ha; Schonewald-Cox 1983), an individual wilderness area and surrounding suitable habitat may contain populations of most species sizable enough to prevent inbreeding depression and genetic drift. For plants and small animals, a single wilderness area may contain multiple demes, some of which may be genetically distinct. For large, wide-ranging animals such as cougars and bears, a network of several large wilderness areas connected by broad habitat corridors might contain multiple demes and permit exchange of individuals among them. At present, such conditions rarely exist due to habitat fragmentation. But enlargement of current wilderness areas: new designations of wilderness, other reserves, and corridors; and more ecologically sensible management of surrounding lands may create acceptable conditions for genetic conservation of entire biotas (Noss 1987a).

The Species Level

The species level is most familiar to us, for the simple reason that species are more tangible than other levels of biological organization (except for the individual, which, animal liberation notwithstanding, usually is unimportant in conservation until a population has declined to an extremely small size). At the species level, the highest concern is maintaining total species diversity at a global scale and native species in natural patterns of abundance at a regional scale; local areas must be managed with this broader context in mind (Noss and Harris 1986). Due to human modifications of habitat and transportation, exotic species and weedy native species now dominate many areas. Big wilderness is not exempt from these problems, but by definition has suffered fewer invasions than other areas. Roadlessness (or low accessibility to humans) is a key to maintaining an intact native species composition.

Population viability theory and practical experience have taught us that small populations are vulnerable to extinction for marry reasons (Soulé 1987). Genetic deterioration represents one class of problems, as discussed above. For most small, wild populations, however, demographic stochasticity (i.e., random fluctuations in reproduction, mortality, and age and sex ratios) is probably a greater threat (Lande 1988). Chance variation in demographic parameters can drive a small population to extinction quite rapidly. For some species, there may be a threshold density or number of individuals below which the population cannot recover. This "Allee effect," named after the animal ecologist W.C. Allee, is likely when organisms modify their environment chemically or physically in a way that encourages their survival, when group defense against predators or competitors is important, or when social interactions and mating success depend on some critical population density (Lande 1988).

To the extent that a species is dependent on the conditions of wilderness, reductions in roadless area in a region predispose it to extinction. Wolves, grizzly bears, and cougars are among the species that often show wilderness dependency, primarily because they are shot or otherwise harassed in areas with high road density (e.g., Thiel 1985). A report by the Congressional Research Service on interagency management of the Greater Yellowstone Ecosystem concluded that road construction is the single greatest threat to the regional ecosystem (Keiter 1989). Because a large wilderness area with a natural disturbance regime will maintain vulnerable species in addition to less sensitive species, the total native diversity of wilderness is expected to be higher than that of a roaded landscape of comparable size. Total species diversity may be higher in the roaded landscape, but many of those species will be exotics or other opportunists that were not a part of the primeval landscape and do not require protected areas for survival (Noss 1983; Wilcove 1988).

The Community Level

A community is a group of species that occupies a particular place. If we add soil, water, and ecological processes such as natural disturbance, we have an ecosystem. The scale of an ecosystem is arbitrary, and ranges from a microcosm in a jar of pond water to the entire biosphere. Terrestrial communities, or associations, are usually defined by their vegetation according to some standard of homogeneity and based on dominant and/or characteristic plant species (Mueller-Dombois and Ellenberg 1974). Animal communities, in turn, often are associated with particular plant communities, although habitat structure in many cases is more important than floristics.

Community-level conservation is complementary to species-level protection. The Nature Conservancy, for example, employs a “coarse filter” by protecting high-quality examples of native community-types, as well as a “fine filter” aimed at particular rare species. The coarse filter is assumed to capture perhaps 85-90% of species without having to inventory or plan preserves for them individually (Noss 1987b).

Community-level conservation does not depend on wilderness, especially if one focuses mostly on plants. In practice, The Nature Conservancy, many state natural areas programs, and the Forest Service in its Research Natural Area (RNA) program, designate small preserves to protect what often are single representatives of community-types. It is acknowledged, sometimes, that such preserves will be missing many of their character&c animals. Plants that depend on particular area-dependent animals for pollination or seed dispersal also will be lost from small preserves. Disturbance management is usually a problem (White and Bratton 1980). In many cases, small remnants were all that was left of a particular community-type. But in other cases, the “living museum” mentality simply supposed that small examples were all that was needed to save a particular kind of community for posterity (Noss and Harris 1986).

What big wilderness has to offer community-level conservation is an opportunity to maintain entire biological communities, including fauna as well as flora. Also in large wilderness areas, communities are represented in their natural context, grading into other communities in the landscape mosaic (see below). Moreover, one problem with the coarse filter is that species assemblages are constantly

changing over time as climate changes and species migrate at their characteristic rates (Hunter and others 1988). Interconnected networks of wilderness would supply the habitat diversity and dispersal corridors necessary for this re-sorting of species into new communities.

The **Landscape Level**

Temperature, moisture, soil structure, and other aspects of the physical environment are gradient phenomena; they vary with elevation, aspect, latitude, and other continua. Each plant species responds to environmental gradients, being most abundant in the portion of a gradient that corresponds to its physiological optimum, and tailing off to either direction. Thus, in the Great Smoky Mountains, Whittaker (1956) was able to map the location of vegetation types in two dimensions along gradients of elevation (corresponding mostly to temperature) and moisture. Subsequent studies convinced Whittaker that plant species are distributed individualistically along gradients in accordance with their autecological tolerances and requirements. The diversity of a landscape is realized only when all environmental gradients and associated species distributions are represented fully.

Superimposed on the environmentally determined gradient-mosaic of vegetation is another mosaic created by disturbance, both natural and (increasingly) anthropogenic. Disturbances occur at multiple spatial and temporal scales, from frequent canopy gaps caused by treefalls, to **wildfires** that recur every few hundred years but cover thousands or millions of hectares. Disturbances at any scale break the dominance of established individuals or species, bring in a flush of resources such as sunlight and moisture, and promote regeneration and growth of new individuals. Disturbances are patchy in time and space, so that a landscape can be viewed as a "space-time mosaic" (Watt 1947) or "**shifting-**mosaic steady state" (Bormann and Likens 1979) of patches in various stages of recovery from disturbance. A major realization of modem ecology is that moderate levels of disturbance enhance landscape complexity and species diversity (Pickett and White 1985). The native species in an area have adapted through evolution to a particular disturbance regime, which may not be mimicked effectively by anthropogenic disturbances.

Maintenance of landscape-level diversity (i.e., an "expanded coarse filter;' Noss 1987b) depends critically on the *size* of the landscape. A **shifting-**mosaic steady state simply does not occur in a small area where a single windstorm might flatten everything. Pickett and Thompson (1978) defined a "minimum dynamic area" as "the smallest area with a natural disturbance regime, which maintains internal recolonization sources, and hence minimizes extinction." In other words, the area is large enough that only a small portion is disturbed at any one time. Recently disturbed areas can be recolonized by species from nearby refugia. Shugart and West (1981) estimated that landscapes need to be 50-100 times larger than the largest disturbance in order to maintain a relative steady state of habitats. Thus, a small nature reserve can "incorporate" treefalls but not wildfires. Even Yellowstone National Park, at 898,000 ha, is too small to maintain a steady state with a natural fire regime (**Romme** and Knight 1982). The minimum dynamic area concept provides a strong argument for large reserves and helps tell us when management interventions are needed to regulate the disturbance regime in reserves that are too small.

The lesson here is that if we want to represent biodiversity at the landscape scale, with naturally occurring disturbances and without excessive management, we will need to set aside huge areas as intact, unfragmented land. Small wilderness areas are almost a contradiction in terms. As areas become smaller, more intensive management is necessary to maintain diversity (White and **Bratton** 1980). Unfortunately, management for habitat diversity in small areas usually benefits weedy, edge species at the expense of forest interior species (Noss 1983).

Big wilderness represents the only opportunity to maintain the ecological gradients and mosaics that constitute native biodiversity at the landscape level. Only in big wilderness can species and communities be studied and appreciated in their **natural** ecological and evolutionary context. This is not to suggest that we abandon our small wilderness areas and other reserves, which often contain important elements of biodiversity. But we must recognize that these small areas are inadequate for landscape-level conservation.

REPRESENTATION OF ECOSYSTEMS IN WILDERNESS AREAS

In the Fourth World Wilderness Conference, in 1987, delegates of 62 nations unanimously voted for a resolution to preserve "representative examples of all major ecosystems of the world to ensure the preservation of the full range of wilderness and biological diversity" (Davis 1988). This principle of representing ecosystems in reserves has a venerable history in the United States. In the **1920s,** the Ecological Society of America's Committee on the Preservation of Natural Conditions for Ecological Study (which evolved into The Nature Conservancy) sought to represent all natural communities in

protected areas (Shelford 1926). In 1933, the Ecological Society's Committee for the Study of Plant and Animal Communities defined three classes of nature sanctuaries, in respect to their adequacy as samples of pristine communities; the definitions were refined in 1950 as follows (Kendeigh and others 1950-51):

First-class Nature Sanctuaries. Fully protected areas, with virgin vegetation and of sufficient size to contain all the animal species in the self-maintaining populations historically known to have occurred in the area (except primitive man).

Second-class Nature Sanctuaries. Fully protected areas, with original vegetation more or less disturbed or fairly mature second-growth, with not more than two important animal species missing from the original fauna, or areas too small to insure maintenance of normal populations of the larger animals.

Third-class Nature Sanctuaries. Small areas inadequately protected or areas modified to a greater extent than those of the first and second classes.

These definitions provide a useful framework for determining which ecosystems, or more accurately which landscape-types, are represented adequately in protected areas. First-class nature sanctuaries correspond to big wilderness, as I have used the term here, and roughly to the level-8 reserves of Schonewald-Cox (1983).

Kendeigh and others (1950-51) noted that "for a community to be adequately represented, large virgin areas with balanced animal populations need to include not only undisturbed climax vegetation but also all important seral stages." Thus, Kendeigh and others anticipated modem conservation criteria based on population viability and minimum critical size for maintenance of ecosystems and landscape mosaics. They stressed the importance of spatial variation in community composition: "(R)epresentation must be repeated at intervals throughout the range covered by the community, in order to include all variations induced by climate, topography, contact with other community types, age, influence of barriers, etc." Kendeigh and others placed particular emphasis on protecting areas big enough to support populations of large predators, because "(i)t is in the absence of the large predators that many sanctuaries are not entirely natural and have unbalanced populations of the various species." As noted by Schonewald-Cox (1983), it is doubtful whether any but the very largest existing reserves will sustain populations of large carnivores and ungulates in the long term.

In 1950, there were no first-class sanctuaries in true deciduous forest, prairie, or at the lower elevations in the Rocky Mountains. Opportunities for creating big wilderness areas in the United States and Canada were mostly limited to inaccessible southern swamps, boreal forests, higher elevations in the western mountains, desert, and tundra (Kendeigh and others 1950-51).

How well have we succeeded in representing American ecosystems in designated wilderness today, more than one-quarter century after passage of The Wilderness Act of 19641 Of 261 major terrestrial ecosystems recognized by a combination of Bailey's ecoregions and Kuchler's potential natural vegetation, 104 (40 %) are not protected in the 36 million hectares of the National Wilderness Preservation System (Davis 1988). In general, the most productive habitats have been appropriated for intensive human uses, leaving behind "rock and ice" as potential wilderness (Foreman and Wolke 1989).

The Size Issue

Minimum area considerations, of the kind discussed by Kendeigh and others (1950-5 1) and elaborated in the recent conservation biology literature, suggest even more dismal conclusions about ecosystem representation in wilderness. As discussed above, ecosystems must be large (often over 1 million ha) in order to manage themselves with natural disturbances and maintain viable populations of large mammals.

If we apply Schonewald-Cox's (1983) criterion of 1 million ha as the size above which a protected area is relatively self-sustaining, only 5 ecosystem types (2% of the 261 Bailey-Kuchler ecosystems) in the United States and Puerto Rico are represented adequately in designated wilderness, and all 5 of these are in Alaska. If we apply a less demanding criterion of 500,000 hectares, only 11 ecosystems (4%) are represented. Only 50 (19%) of the 261 Bailey-Kuchler ecosystems are represented in designated wilderness areas in units at least 100,000 ha in size (Table 1). Twenty-five (50%) of these lOO,OOO-ha ecosystems (in 60 wilderness areas) are represented only in Alaska. Only 4 ecosystem types of 100,000 ha (bottom of Table 1) are found in wilderness areas east of the Rockies.

Protected areas, in general, tend to be small and inadequate representatives of the ecosystems they sample. Research natural areas (RNAs), which were designated specifically for their ecological and scientific values, are far too small to maintain natural processes under any criterion. Ninety-three percent of Forest Service RNAs are smaller than 1000 ha, and the remaining 7% are less than 5,000

ha. National parks, although they contain some units comparable in size to the largest wilderness areas, also are dominated by small units. Wilderness areas average larger, with most between 1000 and 100,000 ha. Only 12% are over 100,000 ha, however, and only 1% (6 areas) are larger than 1 million ha (Figure 1).

SCIENTIFIC VALUES

Why should we care whether ecosystems are represented adequately in wilderness areas? Wilderness areas, like national parks, have been established more for their scenic and recreational values than for any ecological or scientific purposes (Nash 1984). The Wilderness Act specifies that scientific value may be part of the basis for wilderness designation, but it is not mandatory or pre-eminent (Davis 1988). Scientists, such as Kendeigh et al. (1950-51) who emphasized ecological values of big wilderness, have lately been in the minority among wilderness advocates. Indeed, in the several national forest management plans that I have read, all justify (or fail to justify) wilderness purely in terms of Recreation Visitor Days (RVDs). The value of wilderness as a reservoir of biodiversity and natural processes is ignored, despite the fact that the National Forest Management Act (NFMA) regulations require that forest managers, when evaluating the wilderness potential of their lands, consider proximity to other wilderness lands and potential effects on biodiversity (Keiter 1989).

We should know better. A scientist whom we consider the father of the modem wilderness movement was well aware of the ecological values of wilderness 50 years ago. Aldo Leopold spoke in recreational terms when he first advocated wilderness preservation in 1920. But by the mid-1930s, Leopold had matured as an ecologist (Meine 1988). Shortly thereafter, Leopold insisted that wilderness is vital to "the science of land-health," because it offers "a base-datum of normality, a picture of how healthy land maintains itself as an organism" (Leopold 1941). Many ecologists have been interested in wilderness for its value in basic research on how nature works. Leopold suggested another function: that of a benchmark, against which we can compare managed and manipulated lands. In these times of massive experimentation with natural ecosystems, it would seem prudent to maintain control areas. Because our managed lands are landscapes, our control areas must also be at this scale -- that is, big wilderness.

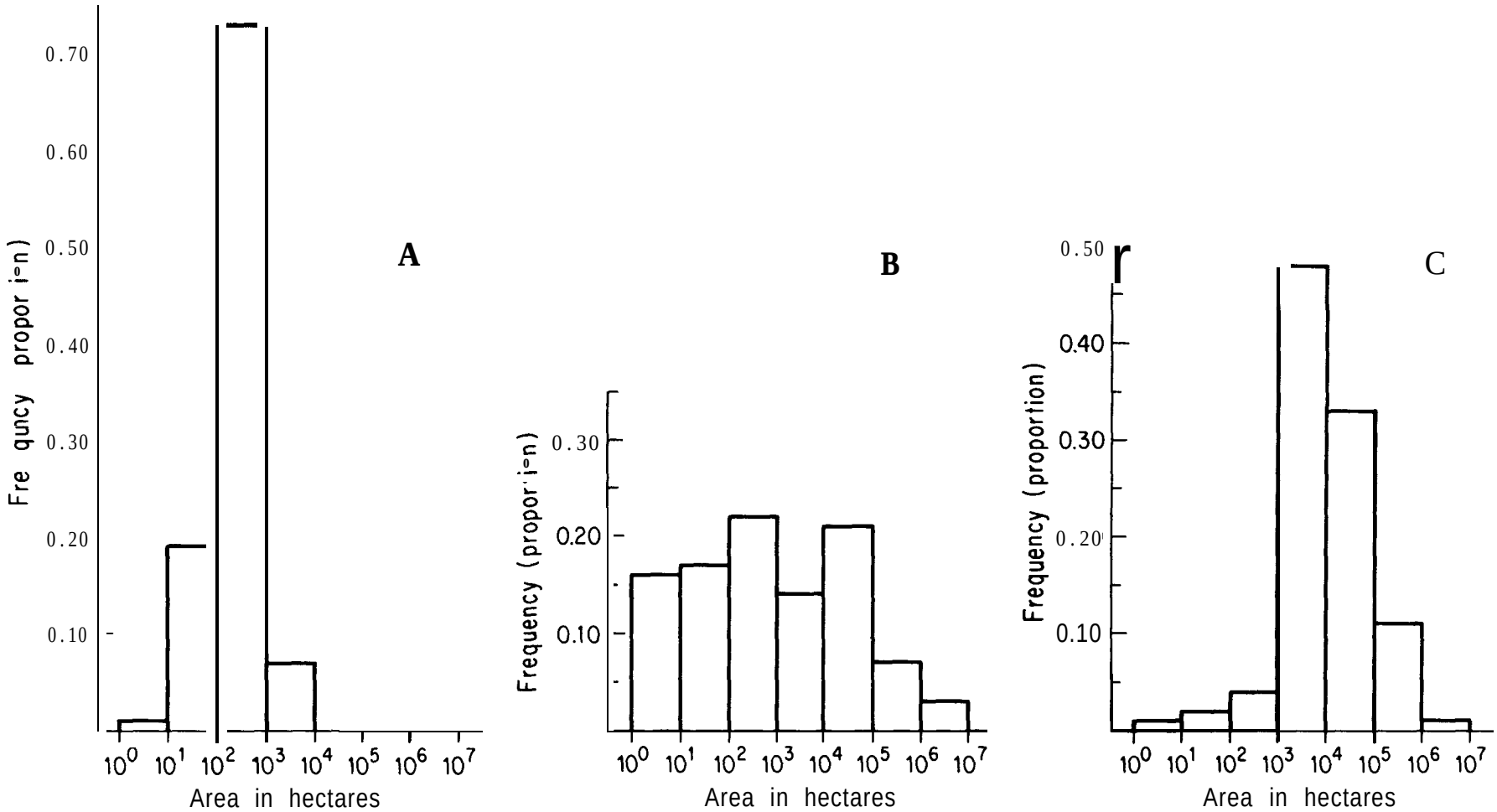
CONCLUSION

Several levels of native biodiversity can be maintained most effectively in big wilderness. Moreover, wilderness areas have enormous scientific value as sites for basic ecological research and as benchmarks for comparison with managed lands. Yet, inventories show that currently designated wilderness falls far short of representing the major ecosystems of the United States even as samples, much less as self-sustaining landscape mosaics with viable populations of large predators and their prey. Many conservationists throw up their hands and conclude that we are not going to get much more than the scraps already designated as wilderness. The likely outcome of proposals now before Congress is another 4-6 million ha added to the current 36 million (Satchel1 1989), far less than needed to achieve adequate representation of ecosystems and meet reasonable minimum-size criteria.

Should we accept the conclusion of no significant additions to the wilderness system? In the short term, this seems inescapable. But designated wilderness and ecological wilderness are not equivalent. Many lands can be managed for wilderness values, and in fact be restored to essentially wilderness condition, without formal designation. Other designations, such as biodiversity management areas, without the "big W" stigma could be promising. Road closures alone can be a significant avenue to recovery of wilderness values (Noss 1987a). Multiple-use lands, if managed to mimic natural disturbance regimes and protect sensitive species, may approximate many ecological values of big wilderness. As demonstrated by recent controversies over management of federal lands, however, most conservationists feel that significant changes in management direction, including a de-emphasis on commodity production, must occur if public lands are to function as biodiversity reserves.

Although the current political outlook on wilderness designation is less than promising, additions to the Wilderness system should be pursued. New designations should concentrate on enlarging existing wilderness areas, connecting areas with broad habitat corridors, and protecting previously unrepresented ecosystem types. Designations should encompass centers of endemism and areas of high native species richness in each region (Scott and others 1990) and should include "wilderness recovery areas" for ecosystems where no existing sites meet strict wilderness standards (Noss 1987a). If we want to have a tallgrass prairie wilderness, for example, it is going to have to be restored. The guiding principle for selecting sites and drawing boundaries should be representation and long-term viability at multiple levels of organization.

Figure 1. Frequency distribution of (a) 213 Forest Service Research Natural Areas (RNAs); (b) 320 units in the National Park system; and (c) 474 units in the National Wilderness Preservation System. Data on National Parks from Schonewald-Cox (1983); raw data on RNAs from U.S. Forest Service (unpublished, 1990); raw data on wilderness areas from The Wilderness Society (in Watkins 1989).



Wilderness managers and advocates also must overcome their aversion to active management. Most wilderness areas are far too small to manage themselves, particularly when stressed by over-visitation, air pollution, and global warming. To the degree that a wilderness area plus surrounding near-natural land is smaller than a minimum dynamic area (which, depending on the ecosystem type, may exceed 1 million ha), it will require active management to maintain natural levels of habitat diversity and viable populations of space-demanding species over time. Management of human activities to protect natural values is particularly needed. For smaller wilderness areas and other reserves, broad habitat linkages between sites may unite them into a functional network (Noss and Harris 1986). although such linkages may not compensate entirely for large size.

Finally, we need to put science back into the wilderness debate. Ecology and conservation biology provide guidelines for wilderness area selection, design, management, and restoration that are biased far less than the aesthetic and recreational arguments that now dominate wilderness discussions. Science offers an appropriate "left-brain" complement to the ethical and spiritual reasons for wilderness preservation that attracted many of us to this business in the first place. We should not, however, count on science to provide a complete justification for wilderness preservation. That justification lies mainly in the value of wilderness as a refuge of sanity, humility, and reality in a deteriorating biosphere. Realizing this, we see most clearly that the present wilderness system is inadequate and that we desperately need to build one that is bigger and better.

ACKNOWLEDGMENTS

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Table 1. Fifty Bailey-Kuchler ecosystem types represented by 100,000 ha or more in 101 out of 474 units of the National Wilderness Preservation System (or wilderness recommended; from Davis 1988). The 50 types are out of 261 in the Bailey-Kuchler classification in the United States and Puerto Rico. Of the remaining 211 types, 104 are not represented at all in wilderness (Davis 1988) and 107 are represented in wilderness in areas smaller than 100,000 ha.

Ecoreeion	Potential Nat. Vegetation	Area Name	State	Area(ha)
Pacific Forest	hemlock-spruce forest	Misty Fjords	AK	464,775
Pacific Forest	hemlock-spruce forest	Admirality Is.	AK	329,500
Pacific Forest	hemlock-spruce forest	Glacier Bay	AK	336,435
Pacific Forest	dryas meadows and barren	Misty Fjords	AK	400,000
Pacific Forest	dryas meadows and barren	Glacier Bay	AK	448,585
Pacific Forest	dryas meadows and barren	Wrangell-St. Elias	AK	613,360
Pacific Forest	dryas meadows and barren	S tikine-Le Conte	AK	150,000
Pacific Forest	dryas meadows and barren	Tracy Arm-Fjord Terror	AK	124,000
Pacific Forest	dryas meadows and barren	South B aranof	AK	100,000
Pacific Forest	dryas meadows and barren	Russell Fjord	AK	124,290
Pacific Forest	dryas meadows and barren	Kenai	AK	280,000
Pacific Forest	icefields	Glacier Bay	AK	336,435

Pacific Forest	icefields	Kenai	AK	100,000
Pacific Forest	icefields	Wrangell-St. Elias	AK	1,500,000
Pacific Forest	alpine meadows and barren	Olympic NP	WA	104,456*
Pacific Forest	alpine meadows and barren	Glacier Peak	WA	157,035
Pacific Forest	mixed conifer forest	Trinity Alps	CA	161,945
Pacific Forest	western spruce-fir forest	Pasayten	WA	111,020
Yukon Forest	spruce-birch forest	Innoko	AK	125,000
Yukon Forest	black spruce forest	Koyukuk	AK	120,000
Yukon Forest	black spruce forest	Innoko	AK	277,000
Yukon Forest	muskeg	Innoko	AK	100,000
Yukon Forest	spruce-birch forest	Andreafsky	AK	150,000
Yukon Forest	dryas meadow and barren	Andreafsky	AK	376,300
Alaska Range	spruce-birch forest	Kenai	AK	200,000
Alaska Range	spruce-birch forest	Lake Clark	AK	175,000
Alaska Range	spruce-birch forest	Katmai	AK	140,600
Alaska Range	spruce-birch forest	Wrangell-St. Elias	AK	200,000
Alaska Range	cottonsedge tundra	Wrangell-St. Elias	AK	140,890
Alaska Range	cottonsedge tundra	Katmai	AK	210,900
Alaska Range	cottonsedge tundra	Becharof	AK	124,000
Alaska Range	cottonsedge tundra	Denali	AK	307,690
Alaska Range	dryas meadows and barren	Denali	AK	346,155
Alaska Range	dryas meadows and barren	Lake Clark	AK	650,000
Alaska Range	dryas meadows and barren	Wrangell-St. Elias	AK	568,000
Alaska Range	dryas meadows and barren	Katmai	AK	843,670
Alaska Range	icefields	Wrangell-St. Elias	AK	500,000
Alaska Range	icefields	Lake Clark	AK	175,000
Alaska Range	alder thickets	Katmai	AK	140,600

Alaska Range	Aleutian meadows	Aleutian Is.	AK	263,150
Alaska Range	Aleutian meadows	Izembeck	AK	117,000
Alaska Range	Aleutian meadows	Unimak	AK	165,000
Alaska Range	Aleutian heath and barren	Aleutian Is.	AK	263,150
Alaska Range	Aleutian heath and barren	Semidi	AK	100,000
Alaska Range	Aleutian heath and barren	Unimak	AK	165,000
Arctic Tundra	cottonsedge tundra	Arctic	AK	150,000
Bering Tundra	cottonsedge tundra	Togiak	AK	319,000
Bering Tundra	cottonsedge tundra	Nunivak	AK	220,000
Bering Tundra	cottonsedge tundra	Bering Land Bridge	AK	500,000
Bering Tundra	watersedge tundra	Bering Land Bridge	AK	500,000
Bering Tundra	dryas meadows and barren	Togiak	AK	600,000
Bering Tundra	dryas meadows and barren	Bering Land Bridge	AK	121,457
Brooks Range	spruce-birch forest	Arc tic	AK	400,000
Brooks Range	spruce-birch forest	Noatak	AK	117,410
Brooks Range	spruce-birch forest	Gates of the Arctic	AK	428,260
Brooks Range	muskeg	Arctic	AK	100,000
Brooks Range	alder thickets	Noatak	AK	235,000
Brooks Range	cottonsedge tundra	Gates of the Arctic	AK	1,213,400
Brooks Range	cottonsedge tundra	Noatak	AK	1,174,000
Brooks Range	cottonsedge tundra	Arctic	AK	300,000
Brooks Range	dryas meadows and barren	Arctic	AK	2,188,865
Brooks Range	dryas meadows and barren	Gates of the Arctic	AK	1,213,400
Brooks Range	icefields	Arctic	AK	100,000
Brooks Range	icefields	Noatak	AK	821,770
Columbia Forest	western ponderosa forest	Frank Church River of No Return	ID	101,215

Columbia Forest	grand fir, Douglas-fin forest	Selway-Bitterroot	MT	113,465
Columbia Forest	grand fir, Douglas-fir forest	Frank Church River of No Return	ID	214,170
Columbia Forest	western spruce-fir forest	Bob Marshall	MT	280,000
Columbia Forest	western spruce-fir forest	Great Bear	MT	111,830
Columbia Forest	western spruce-fir forest	Selway-Bitterroot	MT	339,870
Columbia Forest	western spruce-fir forest	Frank Church River of No Return	ID	121,455
Columbia Forest	western spruce-fir forest	Glacier NP	MT	179,550*
Columbia Forest	alpine meadows and barren	Bob Marshall	MT	115,645
Rocky Mountain Forest	Douglas-fir forest	Washakie	WY	100,000
Rocky Mountain Forest	Douglas-fir forest	Yellowstone NP	WY	112,910*
Rocky Mountain forest	grand fir, Douglas-fir forest	Frank Church River of No Return	ID	202,430
Rocky Mountain Forest	western spruce-fir forest	Absaroka-Beartooth	MT	225,255
Rocky Mountain Forest	western spruce-fir forest	Washakie	WY	150,000
Rocky Mountain Forest	western spruce-fir forest	Frank Church River of No Return	ID	202,430
Rocky Mountain Forest	western spruce-fir forest	Yellowstone NP	WY	705,470*
Rocky Mountain Forest	western spruce-fir forest	Gros Ventre	WY	100,000
Rocky Mountain Forest	alpine meadows and barren	Absaroka-Beartooth	MT	107,390
Sierran Forest	lodgepole pine, subalpine forest	John Muir	CA	115.295
Sierran Forest	lodgepole pine, subalpine forest	Sequoia-Kings Canyon NP	CA	241,520
Sierran Forest	lodgepole pine, subalpine forest	Yosemite NP	CA	257,975
Upper Gila Mountains Forest	pine, Douglas-fir forest	Gila	NM	130,260
American Desert	saltbush-greasewood	Death Valley	CA	270,255*

American Desert	creosote bush	Desert	NV	105,220*
American Desert	creosote bush	Joshua Tree	CA	139,115
American Desert	creosote bush	Death Valley NM	CA	455,575*
American Desert	creosote bush-bur sage	Cabeza Prieta	AZ	196,480*
American Desert	palo Verde-cactus	Cabeza Prieta	AZ	151,760*
American Desert	palo Verde-cactus	Kofa	AZ	149,980*
Colorado Plateau	juniper-pinyon	Grand Canyon	AZ	493,070
Chihuahuan Desert	Trans Pecos shrub savanna	Big Bend NP	TX	203,115*
Intermountain Sagebrush	Great Basin sagebrush Antelope Range	Sheldon	NV	130,070*
Intermountain Sagebrush	Great Basin sagebrush	Desert	NV	382,560*
Laurentian Mixed Forest	Great Lakes pine forest Canoe Area	Boundary Waters	MN	224,695
Outer Coastal Plain Forest	southern floodplain forest	Okefenokee	GA	143,255
Everglades	Everglades	Everglades	FL	188,300
Everglades	mangrove	Everglades	FL	333,115

* wilderness recommended, and presently managed as wilderness

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MANAGING WATER RESOURCES IN WILDERNESS AREAS

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ABSTRACT

In response to the requirements of the Wilderness Act, wilderness managers need to identify threats to water quality, secure and protect water rights in wilderness areas, and identify and implement management opportunities to protect water quality and quantity. Inventory and monitoring activities need to be incorporated into the planning process. Effective management of water resources requires the assessment of threats to water quality and their subsequent impact on the values of the water resources. Management opportunities in water quality differ in terms of the source of the pollution. If the source is from internal land use practices, internal management strategies can be implemented, whereas, if the source is from external land use practices, the wilderness manager must rely on cooperation with neighboring landowners and state laws for water quality protection.

The need to secure and protect water rights in wilderness areas has resulted in a debate over the Colorado Wilderness Bill, which focuses on water in proposed wilderness areas being reserved from appropriation. The water-related reasons for opposition to designation can be described as concerns over precedent, upstream water users who may be adversely affected, and future development opportunities which could be precluded. Water developers see great potential for water development within and adjacent to wilderness areas without unduly infringing upon the basic tenets of the original Wilderness Act. Management opportunities for preservation, scientific study, and societal improvement exist in the inclusion of express water reservations in future designations and state and Federal laws protecting existing water rights.

INTRODUCTION

The Wilderness Act of September 3, 1964 (PL 88-577, codified at 16 U.S.C. 1131-1136 (1982)), established a National Wilderness Preservation System to be composed of Federally owned areas designated by Congress as "Wilderness Areas," administered for the use and enjoyment of the American people in such manner as will leave them unimpaired for future use and enjoyment as wilderness. In addition, the Act states that the areas are to be managed for the protection of these areas, the preservation of their wilderness character, and for the gathering and dissemination of information regarding their use and enjoyment as wilderness.

Appropriate management of water is not limited to a single resource, but rather protecting and managing entire ecosystems.

Water and its associated values are primary resource components in many of these areas. Trails and campsites are generally located along or near water. In addition to aesthetic values, water is necessary for aquatic organisms and riparian ecosystems.

Given the purposes of the Act, one would expect that the waters of wilderness areas would be free flowing and the purest in the land. However, that is not necessarily the case, particularly in areas which are not located at the headwaters of a watershed. External land uses, as well as recreational and authorized non-recreational uses within wilderness areas, can have significant impacts upon water quality and quantity. The purposes of this paper are (1) to examine the issues of protection of water quality and securing and protecting water rights in wilderness areas and (2) to discuss opportunities available to wilderness managers to protect water quality and quantity.

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WATER QUALITY

To effectively manage water quality in wilderness areas, inventory and monitoring activities need to be incorporated into the planning process. Appropriate management of water is not limited to a single resource, but rather protecting and managing entire ecosystems. Water resource inventories provide basic information on the class, distribution, natural variation, and condition of the water and related resources. Monitoring is designed to detect changes and quantify trends in the water resource condition. Also, present and potential threats to the quality of water from internal and external land uses need to be assessed to focus management planning. The values (or uses) of the resource need to be identified, and specific water quality condition objectives are needed to provide a management target to mitigate water-quality problems or maintain a water quality condition.

In a wilderness area, the public has greater expectations of the quality of water than in most watershed systems. These expectations are associated with water values. Perhaps the most obvious value is the aesthetics of a stream or lake. Sufficient flows are desirable to eliminate any stagnant, deoxygenated pools and to provide a healthy environment for fish and associated biota. Other suitable water quality conditions for aesthetic value include: (1) crystal clear water that is free from high sediment loads, (2) odorless water, (3) "acceptable" color, (4) low concentrations of algae, (5) cool temperatures, and (6) productive fish population.

In addition to the aesthetic value of water resources, the public expects water in wilderness areas to be drinkable, swimmable, and of adequate quality and quantity for boating, rafting, fishing, and healthy aquatic life. Public perceptions of the wilderness experience include partaking of a refreshing drink from pure mountain streams. This expectation assumes that the water in that watershed is safe and without human-caused degradation in quality. **However, these expectations frequently are not met, particularly in areas which are not located at the headwaters of a watershed. External and internal land uses within and upstream from the wilderness areas can have significant impacts on water quality.**

Inventory and Assessment of Threats to Water Quality

Inventories of water quality need to identify the present condition of ground and surface water resources, provide a baseline for future condition assessment, and describe the values which are dependent upon maintaining or enhancing water quality. An inventory includes an evaluation of existing water resources and related information and may include collection and analysis of synoptic (intensive in space) or temporal (intensive in time) water resources data. Physical, chemical, and biological information need to be collected and analyzed with an emphasis on the ecosystem approach. This approach provides a framework to establish ecologically and statistically valid baseline conditions and assess water quality in entire regions by monitoring a relatively small number of sites (Plafkin and others 1989). Some of the significant information that needs to be assessed in a water resources inventory includes basic ground and surface water quality and quantity, watershed and stream characteristics, aquatic community attributes, presence and biotic effects of toxins, and water quality legal and regulatory framework.

Pollution sources and their subsequent impact on the values of the water resources need to be identified in conjunction with a summary of potential constituents and water-quality threats for each watershed. These threats to the water resources can occur either from internal activities such as nomecreational or recreational uses or from external land use activities. The inventory and monitoring program needs to be aimed at the source and type of pollutant and ultimately designed to support management actions which mitigate the threat.

Specific examples of nonrecreational uses in the National Wilderness Preservation System are identified in Reed and others (1989). Water quality can be impacted by social, commercial, and other nonrecreational uses. For instance, poor water quality can severely impact threatened and endangered species, both aquatic and terrestrial. Subsistence, spiritual sites, therapeutic, and human development programs depend upon aesthetic, drinking, and sometimes fishing uses of water. Conversely, these nonrecreational uses, if not properly managed, can introduce bacteria, viruses, and parasites that adversely affect the intended uses of the water. Therefore, it is critical that management recognizes the potential impacts of uses on the water resource condition, the potential effect of the water resource condition on the uses, and the potential conflicts between uses of water resources.

Other threats to water quality in wilderness areas come from outfitting and guiding services and grazing which can cause: (1) increased erosion resulting in high turbidity and sediment loading which affect aesthetics and fisheries habitat, (2) increased animal and human waste contaminating water with bacteria, viruses, and parasites which in turn may infect those who drink the water, and (3) degradation of riparian vegetation resulting in higher stream temperature which affects the fisheries and biota.

Oil and gas extraction and mining can have severe impacts upon water quality. Oil spills or natural oil seeps may coat stream channels affecting fish and wildlife and depressing dissolved oxygen levels. Leaking or breached ponds may introduce brine, drilling mud, or other fluids containing chlorides, iron, manganese, ammonia, detergents, or heavy metals. Depending upon the type of mining, a variety of potential impacts are associated with different mining activities. Turbidity and suspended sediment increase with most mining activities, and lowered pH values can mobilize metals causing severe contamination and impacting aesthetic, drinking, fish, and wildlife uses.

Wilderness managers need to be concerned not only with water quality impacts from nonrecreational uses within wilderness area boundaries, but also with water quality threats from external land uses upstream and from atmospheric sources. In addition to the previously mentioned nonrecreational impacts, wilderness areas that are not located in the headwaters of a watershed can be affected by point and nonpoint source pollution from urban, agricultural, and silvicultural sources.

As urban areas expand, downstream wilderness area managers must anticipate the impacts produced by urban stormwater runoff, contaminated flows from landfills, and sewage and industrial wastewater. Urban development generates a multitude of contaminants and high peak runoff. Wilderness areas can be impacted by increases in sediment delivery, biochemical oxygen demand, coliform bacteria, oil and grease, nutrients, pesticides, heavy metals, sodium, chloride, and a variety of toxic contaminants (U.S. Environmental Protection Agency 1983). Restrictions on fishing, drinking, and bathing may result from these nonpoint source activities.

A variety of pollution problems associated with non-urban areas also can affect water quality in downstream wilderness areas. Agricultural pollution problems in the United States have been ranked in the following order of priority: (1) erosion resulting in sedimentation, (2) high nutrient concentrations, (3) pesticides, (4) animal waste from small feedlots, (5) fertilizers, and (6) salinity (U.S. Environmental Protection Agency 1984). These nonpoint sources of pollution may affect the quality of water resources in wilderness areas, and, thereby, affect the suitability of the water for some uses.

Silvicultural activities and maintenance of powerline or other rights-of-way can be problematical wherever chemical spraying, machinery use, timber harvesting, road construction and related activities impact streams flowing into wilderness areas. These land uses result in increased turbidity, contamination by herbicides, insecticides and rodenticides, and increased levels of sodium and chloride. These chemical compounds have either acute or long-term chronic effects upon fish. Undesirable metals or other substances may accumulate through bioaccumulation and biomagnification in the food chain making their flesh unsafe for human consumption. Therefore, identification of the threats to the water resources from internal and external land uses, evaluation of the resource values, and assessment of existing information and present water resource conditions will be needed if the wilderness manager is to identify challenges and devise management approaches for their resolution.

Monitoring and Management Opportunities

Wilderness water quality management opportunities will be controlled by the source of the pollution. As previously stated, water quality in wilderness areas can be adversely impacted from both internal and external land uses, especially if the wilderness is not a headwaters area. If degradation of water quality is attributed to activities within the wilderness, management actions can relocate campsites or trails; regulate the number of visitors; apply or require best management practices for private inholdings, mines, and oil and gas extraction; and restrict lunch and overnight sites for outfitting and guiding services.

However, if the source of water quality degradation lies outside the boundaries of the wilderness area, managers, under Section 313 of the Clean Water Act, must generally rely upon the requirements of state laws for water quality management. Many wilderness areas may qualify under a state's antidegradation policy as having "Outstanding National Resource Waters" (ONRW). The designation is designed to safeguard the state's highest quality waters and to maintain the quality of waters that have special ecological importance. Therefore, effective water quality management in downstream wilderness areas will require: (1) effective liaison with state officials to identify water quality problems from nonpoint and point sources outside wilderness areas, (2) determining the appropriate statutes, programs, and policies under state law and the Clean Water Act to address water quality problems, and (3) petitioning for designation as ONRW or influencing the application process. Additional management opportunities in water quality exist in Wild and Scenic River designations, existing laws to protect threatened and endangered species, and Federal and state laws such as the Resource Conservation and Recovery Act, National Environmental Policy Act, Toxic Substances Control Act, Comprehensive Environmental Response Compensation and Liability Act, and the Federal Insecticide, Fungicide, and Rodenticide Act.

Wilderness managers will need to develop monitoring schemes to answer specific management questions. For instance, if it is a management objective to maintain cold water trout fisheries, a monitoring plan should be designed and implemented to determine if present conditions meet this objective and if present trends indicate a continuation of this use. If the objective is not or will not be met, and the source of the degradation is within the wilderness area, previously mentioned solutions to the problem can be implemented. If, on the other hand, the condition is not or will not be met, and the source of the degradation lies outside the wilderness area, then the manager must work with the state to secure enforcement and to design effective monitoring actions outside, and upstream, of the wilderness.

Identification of the threats to the water resources from internal and external land uses, evaluation of the resource values, and assessment of existing information and present water resource conditions will be needed if the wilderness manager is to identify challenges and devise management approaches for their resolution .

Information on a variety of specific management alternatives for nonpoint source pollution from agricultural, urban, construction, silviculture, and landfill sources are available for the wilderness manager (Association of State and Interstate Water Pollution Control Administrators 1985). Some of these alternatives can also be applied to point source discharges regulated by the states. The primary management opportunities for wilderness areas in the water quality arena are in cooperation with the state using existing Federal, state, and local laws, programs, and policies.

WATER QUANTITY

A long-lived and fervently fought debate over the Colorado Wilderness Bill revolves, at least in part, around the notion that water in the proposed wilderness areas might be reserved from appropriation. The water-related reasons for opposition to designation are complex but can be described by one of three categories: (1) a precedent might be set which could affect other Federal claims to reserved water rights, (2) upstream water uses might be adversely affected, and (3) future development opportunities could be precluded.

This section will examine these three reasons within the context of current and anticipated opportunities and challenges. Furthermore, to understand the nature of the "wilderness water" issue, we will first attempt to develop in the reader an insight into the relationship of water and western water rights.

Western Water Law

The body of law which relates to the use and ownership of water in the West is, for the most part, called the Doctrine of Prior Appropriation. The doctrine provides for priority in right based upon priority in time. By being first to take water and put it to "beneficial" use, an "appropriator" gains a preference in times of scarcity. This is popularly know as "first in time - first in right" (Cox 1982).

This approach to the allocation of scarce supplies of water produces proprietary rights which, generally, may be sold and used by another as though that person had made the original appropriation. The property right is usufructuary; it is a right to the use of the property and not to the body of the property. Thus, the appropriator has rights to water which are tied to its use (Cox 1982).

The unique nature of surface water has forced a certain flexibility upon western water law. Specifically, the "property" flows, making it variable in time and space; it is naturally replenished making it virtually perpetually available; the degree of replenishment varies with time making it periodically scarce; it tends to be only partially consumed in most uses making it reusable; and it is integral to all aspects of life on this planet making it essential for most things. As a consequence, western water law recognizes the fact that water can be used at locations other than in or immediately adjacent to the channel in which it flows, the uses to which it can be placed are many, and other water users rely upon the return to the channel system of the water not completely consumed by appropriator's having senior rights (earlier dates of priority). In most western states, therefore, water rights may be severed from the land and sold independent of land ownership; rights may be limited by attributes of time (for example, season); limited in rate of delivery and total volume; limited by the kind of use; improved upon through storage; and lost through non-use ("Beneficial use is the measure and the limit to the use of water." (Trelease 1979)).

To this point, the discussion has focused on surface water rights to the exclusion of rights associated with ground water. There are differences in the way these forms of water are addressed in western water law. However, for the purposes at hand these differences will not be treated except to state that ground water law is complex and evolving (Thomas 1961).

Federal Reserved Water Rights

Based upon western land acquisitions from France, England, and Mexico, the ownership of water and land in the West was vested with the United States federal government in the Public Domain until the enactment of the public land laws. As a result of these laws (for example, the homestead and mining laws) water was severed from the public domain and made available for allocation and administration under state law subject to Congress' power to regulate and control navigation (Walston 1986).

When the United States dedicated lands within the Public Domain for specific purposes which required water, such as Indian Reservations, a dilemma arose. If the United States had relinquished its ownership of water in the Public Domain, then water for the needs of the reservation was subject to the limitations of state law and, consequently, other appropriators. If such an eventuality were to arise, a conflict between Federal and state laws would result.

This conceptual dilemma became a reality around the turn of the century when western water law threatened to frustrate the intent of Congress when it established an Indian Reservation in Montana. The United States Supreme Court addressed the issue in Winters v. United States (207 U.S. 564 (1908)). In a much debated decision the court determined that a water right existed for the purposes of the reservation and was created by Congressional implication. Furthermore, this right arose with the establishment of the reservation, took its priority from that date, and was for an unquantified amount of water not otherwise appropriated at that time (Fairfax and Andrews 1979).

The creature that resulted was a creation of the court; a creature likened by some attorneys to the one created by Herr Frankenstein. Moreover, as the nature of the Court has changed over time, so too has the Federal Reserved Water Rights Doctrine. In addition to the above, its features now include the following:

- the Federal reserved water right is not lost by non-use
- the term 'reservation' refers to any federal 'enclave'
- the purposes for which water can be used are the primary purposes for which the reservation was established
- the right is for existing and future needs
- the amount of the water right is the minimum amount necessary for the purposes of the reservation

Wilderness and Water Rights

In a July **26,** 1988, Memorandum, the Department of the Interior's Office of the Solicitor advised the Secretary of the Interior on the issue of whether to file claims for Federal reserved water rights for wilderness areas administered by the Bureau of Land Management and the National Park Service. This memorandum constituted a supplemental opinion superseding and substantially modifying an earlier Solicitor's Opinion (M-36914) which had guided Interior Department agencies in their preparation and submission of water rights claims since 1979.

The earlier Solicitor's Opinion had concluded that the Congressional designation of wilderness areas under the authority of the Wilderness Act implicitly reserved, from waters unappropriated at the time of such designation, the water necessary to accomplish wilderness purposes. In other words, the earlier Solicitor's Opinion took the position that Federal reserved water rights arose when Congress "reserved" lands as wilderness areas. This meant that the water necessary to meet the Congressional purposes of wilderness preservation was also "reserved" from the unappropriated water occurring within, under, or adjacent to the wilderness.

Conversely, the July Memorandum, reached the conclusion that Congress intended not to reserve water for wilderness purposes. Supporting this conclusion, the Supplemental Opinion cited evidence of a Congressional desire to avoid any reservation of water additional to that already created for the underlying parks, forests, and refuges. The supplemental opinion also cited evidence which assigned wilderness purposes to a position secondary to those of the underlying park, forest, or refuge. It went on to point out that water rights for wilderness purposes may be appropriated under State law, purchased, or expressly (as opposed to implicitly) reserved by Congress.

Present and Future Challenges

As indicated above, the water-related opposition to designation of new wilderness areas in Colorado falls into three categories. An examination of these will

help in understanding the water quantity-related challenges to nonrecreational wilderness uses.

The first category listed, **precedent which could affect other Federal claims to reserved water rights,** may arise from apparent rather than real concerns over precedent. The Federal reserved water rights doctrine has been well defined by the U.S. Supreme Court and, though still evolving, it seems unlikely that significant changes will occur in the foreseeable future. Nevertheless, parties which traditionally have argued against the doctrine continue to do so whenever the issue surfaces. Whether this is the result of their rejection of the basic premise or their commitment to remain vigilant to potential "revitalization" of the doctrine is difficult to say.

The only significant question which could have potential precedent value is, "Does the creation of a wilderness area from lands previously reserved create a new "reservation" with attendant reserved water rights?" The magnitude of the question can be seen best if examined in the affirmative. In such a case a reserved right would be recognized for the minimum amount necessary to prevent the defeat of the reservation purpose. Such water right would vest in priority with the date of the wilderness reservation.

What this amounts to is a right for an unknown, at this time, quantity of water with a 1990 or later priority date for new wilderness areas. The quantity could arguably be all water on, under, or contiguous to the reservation (in view of the broad purposes for wilderness designation). However, the quantity may be of less importance than the priority. That is not to say a 1990 priority is valuable in-and-of itself--there is very little, if any, water available for such a junior appropriation. However, under Colorado law changes in existing appropriations can only be made if there is no injury to other appropriators, senior or junior. Thus, it could happen that future opportunities for changes in senior water rights could be limited by the recognition of a junior wilderness water right.

Another concern about precedent may be found in the possible proliferation of recreation-based water rights. Though increasing in the west, a water right for recreational uses such as river rafting is not generally recognized as beneficial. This is the case in Colorado. Because the uses of reserved rights are not limited by state water law, the creation of "new reserved" water rights, especially for wilderness purposes, could augur the proliferation of such water use at the "expense" of the future development of more "traditional" beneficial uses.

The second category listed, **upstream water uses might be adversely affected,** follows similar lines of reasoning. Under the prior appropriation doctrine a water right of such junior priority would not operate to the detriment of senior upstream, or downstream for that matter, appropriators. A water right can be satisfied under state law only when it is in priority (i.e., all senior rights have already been satisfied). Furthermore, with most Colorado wilderness areas located in the headwaters of their watersheds, an effect upon upstream water uses is more of an academic consideration than a real potential. The concern, it would appear, devolves to a consideration of the effect of a junior appropriation upon future opportunities to make changes in existing senior water rights.

The third category of concern, **preclusion of future development opportunities,** is essentially a restatement of the foregoing. Many Colorado water development entities have publicly described plans to fully "develop", or make use of, Colorado's high elevation water resources. Much of this water is currently being delivered to the lower basin states of the Colorado River Basin Compact because it is presently in excess of the immediate needs of the upper basin states.

Efficiency and economy dictate that water be diverted and stored where gravity can be used to advantage and where evaporative depletion is the least. Thus, there is economic advantage in tapping water sources at cool, high elevation sites, including those within wilderness areas. The notion of developing water sources within wilderness areas is not far fetched, as evidenced by Colorado's Holy Cross Wilderness. Under the terms of the Act creating this wilderness area, water in its high mountain streams is scheduled for diversion and delivery through tunnels to the east slope of the Rockies, where it is to be used by a burgeoning population.

Water is at issue in other contemplated wildernesses. The Congress is presently debating H.R. 2570 in the House and S. 2117 in the Senate. These Bills would designate certain Bureau of Land Management lands in Arizona as wilderness. Of pivotal importance in both bills is the issue of Federal Reserved water rights for wilderness purposes. As presently formulated, designation would include an express Congressional reservation of water sufficient to fulfill the purposes of wilderness designation. Furthermore, this reservation is expressly defined to be in addition to any existing Federal reserved water rights. This means that a Federal reserved water right would be created at the time of designation by an overt action by Congress rather than a judicial interpretation of Congressional intent. The basis for the water right will not, therefore, have to be interpreted by the courts as implied in the intent of Congress.

Management Opportunities

What looms ahead in the way of water quantity management opportunities depends upon one's

perspective. Water developers see great potential for water development within and adjacent to wilderness areas. High quality water in generally favorable settings offers future opportunity to provide water to rapidly growing population centers. The manner by which this water will be developed, if it is to happen, will require skill and delicacy. Nevertheless, many engineers feel that water can be developed in these areas without unduly infringing upon the basic tenets of the original Wilderness Act.

Thus, from this perspective, wildernesses offer great management opportunities as "water warehouses." Water produced in these areas generally is free of human-caused impacts to quality and generally is found at locations where evaporative loss is minimized and gravity can be used for water delivery rather than costly and energy consumptive pumping.

Those who favor the environmental features of wilderness would view water development as anathema to the entire concept. For these individuals water withdrawal and/or storage is diametrically opposed to preservation, scientific study, societal improvement, and the many other attributes of wilderness they value. The effects of such development upon threatened or endangered species, gene pools, and other features of a natural environment unaltered by humans are difficult to predict, which is argument enough for many to seek to preclude such influences.

The management opportunities for these wilderness uses will likely reside in actions to prevent such water development. These will include the use of any authority available to preserve natural flows and standing water levels. Among those that may be used are existing Wilderness Act designations; the inclusion of express water reservations in future designations; state and Federal laws protecting existing water rights; Wild and Scenic River designations; existing laws to protect threatened and endangered species; state laws concerning the Public Welfare; the Public Trust Doctrine; instream flow rights held by the state; Navigation Servitude; interstate commerce; land access controls under the Property Clause (for Federal lands); and acquisition of property rights in land and/or water.

SUMMARY

Because the Wilderness Act states that wilderness areas are to be managed for their own protection, the preservation of their wilderness character, and for the gathering and disseminating of information regarding their use and enjoyment as wildernesses, water quality should be protected and water rights secured in wilderness areas. Effective management and protection of water quality in wilderness areas will require an inventory and monitoring effort. Identification of the threats to the water resources from internal and external land uses, evaluation of the water resource values, and assessment of existing information and present water resource conditions will enable the wilderness manager to identify challenges and devise management approaches for their resolution.

Management opportunities will be a function of the source of pollution. Internal management strategies can be implemented to address some pollution sources. However, pollution sources outside the wilderness area must be addressed through the requirements of state laws and the Clean Water Act. Additional management opportunities in water quality exist in Wild and Scenic River designations, existing laws to protect threatened and endangered species, and Federal and state laws such as the Resource Conservation and Recovery Act, National Environmental Policy Act, Toxic Substances Control Act, Comprehensive Enviromnental Response Compensation and Liability Act, and the Federal Insecticide, Fungicide, and Rodenticide Act.

The need to secure water rights in wilderness areas has resulted in heated debates throughout the West. The major concerns involve the possible proliferation of recreation-based water rights and the possible effect of junior wilderness appropriations upon future opportunities to make changes in existing senior water rights.

Water developers see great potential for water development within and adjacent to wilderness areas without unduly infringing upon the basic tenets of the original Wilderness Act. In contrast, individuals who favor preservation, scientific study, and societal improvement diametrically oppose withdrawal and/or storage of water in wilderness areas. Management opportunities for these wilderness uses exist in the inclusion of express water reservations in future designations, state and Federal laws protecting existing water rights, Wild and Scenic River designations, existing laws to protect threatened and endangered species, state laws concerning Public Welfare, the Public Trust Doctrine, Navigation Servitude, interstate commerce, land access controls under the Property Clause, and acquisition of property rights in land and/or water.

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CULTURAL RESOURCES IN WILDERNESS AREAS: COMPATIBILITY OR CONFLICT?

Keith Corrigall, Kent Schneider and Patrick Reed'

ABSTRACT

Management of cultural resources in wilderness is an important but often neglected and misunderstood practice. Conflicts with other wilderness purposes most commonly arise in the protection and interpretation of historic and prehistoric sites. The Bureau of Land Management in particular faces a challenge in the coming years due to the expected designation of a large number of wilderness areas with significant cultural resource values in the Western states.

INTRODUCTION

Twentieth century wilderness managers must begin to face the problems of the twenty-first century today, well before the year 2001. One of our more immediate problems is the proper management of cultural resources within wilderness.

The root of the cultural resources management problem in wilderness is the definition of wilderness as an area "untrammeled by man;" that is, without human manipulation or influence. However, the presence of cultural resources in wilderness areas, including both historic and prehistoric sites, is obvious evidence that these areas have been used and more or less permanently modified by man. In most cases these human impacts occurred centuries ago. Not only are wilderness managers tom between preserving the signs of past human influence in an otherwise untrammeled environment but they also must often consider additional human modification to do so.

SOMECULTURALRESOURCE MANAGEMENT ISSUES

Since the passage of the Wilderness Act in 1964 there has been a question as to whether cultural resources in wilderness should become an abandoned lot, left to decay unnoticed purposefully or because no one will survey for sites in wilderness. Rumors persist that archeological and historic sites will be vandalized and looted because they can't be protected. Some have decried any efforts at on-site interpretation within wilderness boundaries (only signing outside the boundaries, it is suggested, is appropriate or legal).

Not only are wilderness managers torn between preserving the signs of past human influence in an otherwise untrammeled environment but they also must often consider additional human modification to do so.

The Wilderness Act does not specifically prohibit these cultural resources management activities. If anything, it is permissive on the subject of use of wilderness for recreational, scenic, scientific, educational, conservation, and ***historic*** purposes. Although there are some basic differences in how the regulations implementing the Act are interpreted by the different agencies, the cultural resources goals remain the same whether the site is within designated wilderness or not: inventory, evaluate, protect, and enhance. The questions of compatibility or conflict do not apply to whether the cultural resources goals will be met (Throop 1990). The goals will be met: but they will be met in ways that are compatible to maintaining wilderness values.

Cultural resources in wilderness include both prehistoric and historic sites, objects, and other remnants of the past. The crux of the cultural resource problem faced by wilderness managers is how to manage cultural resources within a wilderness environment and administrative

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framework. Three major issues help illustrate the problem.

Should cultural resources be left unnoticed in wilderness? Section 110 of the 1966 National Historic Preservation Act (NHPA) requires each federal agency to establish a program to "locate, inventory, and nominate" all properties that appear to qualify for inclusion on the National Register of Historic Places (16 USC 470h-2). This means that wilderness is to be inventoried for cultural resources using records search, pedestrian survey, site locational models, informant interviews, and all other techniques that are appropriate for finding sites wherever they exist. Section 106 of the NHPA also applies to activities within wilderness.

Should cultural resources be protected in wilderness? The Archeological Resources Protection Act (ARPA) of 1979 carries provisions for permitting the excavation or removal of archeological resources and there are civil and criminal penalties for violations (Neuman and Reinburg 1988). No distinction is made for wilderness versus other areas where the provisions of the Act apply. Those who loot or vandalize archeological and historic sites inside wilderness boundaries have been, and should be, prosecuted.

No land managing agencies exist which are unaffected by projects that might damage or destroy archeological or historic sites. The major impetus for both inventory and removal of cultural resources has been the threats associated with the construction and operation of permanent structures and roads. Historically, projects have been ranked by the extent to which damage or destruction to sites might occur. Those with the greatest damage or destruction potential have gotten cultural resources treatments first. Because such activities are generally prohibited in wilderness, and because of tight budgets, little effort by comparison is generally expended in either activity within wilderness.

Should cultural resources be interpreted within wilderness? The question of interpreting the cultural heritage that exists inside wilderness boundaries also arises. Cultural resources that exist inside wilderness can be interpreted. Exactly how, is a different story. Once again, the Wilderness Act is permissive providing that wilderness values are emphasized. It is the policies of the different agencies that put strictures on how interpretation will be carried out. The reasonableness of these policy limits on interpretation seem dependent on one's philosophical perspective regarding how involved visitors must be with the objects to be interpreted in order to have a satisfying interpretive experience. To emphasize wilderness values means that conventional audio-visual aids are more appropriate than the glossy high tech methods which we have come to associate as good for interpretation.

Presently, and probably for some time to come, the debate over sufficiency of interpretive efforts will continue.

Certainly the conduct of cultural resources surveys, site testing, and interpretation may be different in wilderness. Many wilderness areas are rugged terrain, steeply sloped with few flats and away from major or annual water sources. The kinds of prehistoric and historic uses made of these marginal areas, and the frequencies of use, might be different and less than in areas more accessible and habitable. Survey techniques might vary in intensity and scope of overage depending on the terrain. Handtools rather than backhoes and powerscreens would be employed in testing sites for National Register eligibility. Stabilization may be a preferred form of preservation for those sites chosen for perpetuation. Law enforcement surveillance could be more difficult to perform because motorized vehicles carrying investigators and equipment cannot be used to access wilderness. These are examples used to illustrate that wilderness and cultural resource goals and the ways these are met are not in themselves compatible. The real challenge that faces wilderness and cultural resources managers is to jointly develop and maintain the dialogue and working relationships that will get both jobs done.

Our efforts to develop cultural resource guidelines is partially an attempt to administratively deal with a problem before Congress finds it necessary to mandate a solution.

CULTURAL RESOURCES IN BLM WILDERNESS

While all agencies managing wilderness face cultural resource management problems, the Bureau of Land Management (BLM) is especially concerned with these resources. The relative abundance of cultural resources located in BLM-managed wilderness areas is greater than that found in areas managed by the other three federal agencies. Although the number of cultural sites in BLM wilderness areas has not been quantified it is estimated that at least 50 percent of the cultural sites found in designated wilderness areas in the Western states will ultimately be identified on BLM lands. There are several reasons for the concentration of cultural resources on BLM wilderness areas. First, many of the BLM lands are lower and more arid, allowing for better preservation of the sites and associated artifacts. Secondly, these lower areas were better suited to

year-around occupation which led to more human use and more cultural sites.

Like the USDA Forest Service, BLM as a multiple-use agency must implement laws which sometimes appear in conflict with other laws. For example, BLM manages the wilderness resources according to the Wilderness Act of 1964, the National Environmental Policy Act, and the Federal Land Management Policy Act of 1976. On the other hand, BLM manages cultural resources under the requirements of various cultural resource protection laws including the NHPA, ARPA, and the American Indian Religious Freedom Act. Sometimes the requirement to protect cultural resources appears to conflict with the requirement to protect wilderness resources.

There is already precedence for specific guidelines to manage particular resources in wilderness. For example, we have Congressionally mandated wilderness grazing guidelines dating back to the passage of the 1980 Colorado Wilderness Bill. More recently, the Arizona Wilderness Bill of 1990, as presently written, includes reference to wildlife management guidelines.

BLM has also worked with the Society of American Archaeologists and some of the wilderness interest groups (e.g. The Wilderness Society and the Sierra Club) to develop basic nation-wide guidelines for the management of cultural resources in wilderness areas. These guidelines will set consistent procedures to help BLM meet its mandate to protect both cultural resources and wilderness resources.

Our efforts to develop cultural resource guidelines are partially an attempt to administratively deal with a problem before Congress finds it necessary to mandate a solution. BLM's proposed guidelines have been thoroughly reviewed and should be issued in final by June of 1990. The guidelines emphasize protection of both cultural and wilderness resources, setting forth what cultural resource management actions are appropriate in a designated wilderness area. These guidelines emphasize preserving cultural resources in situ. For example, salvage operations may occur where necessary. Wilderness compatible inventory methods are encouraged. Interpretive facilities are restricted to areas outside designated wilderness.

BLM has an *affirmative* responsibility to protect cultural resources in wilderness. Where natural conditions threaten specific cultural remains, BLM must balance its responsibility to protect cultural resources against its responsibility to protect wilderness resources. These guidelines will help to better protect both resources.

CONCLUSION

The historical values of many wilderness areas are exemplified in the cultural resources found there--the historic and prehistoric artifacts and sites of human habitation. Although the cultural resources within wilderness generally do not face the same or as severe threats as those found on many other federal lands they, nevertheless, deserve improved management attention if their benefits are to be preserved for Americans in the twenty-first century.

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SCREENING CRITERIA TO FACILITATE VISIBILITY PROTECTION IN CLASS I AREAS

David M. Ross'

ABSTRACT

The Clean Air Act as amended in 1977, charged the federal land manager with the affirmative responsibility of protecting the air quality related values of Class I areas from possible adverse impacts due to sources of air pollution. The act also identified visibility as one of the Class I air quality related values (AQRVs) to be protected. The difficulty the federal land manager faces in providing the mandated protection is the lack of usable values which could serve as viable screening criteria in making a determination as to whether a proposed new source will threaten the pristine nature of a Class I area and subsequently the quality of the recreational experience sought by area users.

The purpose of this paper is to propose screening criteria based on physical measures of haze optical characteristics and psychological measures of human visual sensitivity which could be used by the federal land manager to protect Class I areas from visibility impairment. The paper also attempts to provide information needed by the federal land manager in making an adversity determination by exploring results from several research projects concerned with assessing the psychological value and importance of good visual air quality to public land users.

INTRODUCTION

The 1977 Clean Air Act (CAA) amendments (Part C) charged the federal land manager (FLM) with "the affirmative responsibility to protect the air quality related values (including visibility) within a Class I area and to consider...whether a proposed major emitting facility will have an adverse impact on such values" of designated Class I areas (Section 165 B)(U.S. Congress). Insight on the meaning of affirmative responsibility can be gained from CAA legislative history. Senate proceedings on the CAA (U.S. Senate report 95-127) contended that "the Federal land manager should assume an aggressive role in protecting the air quality related values of lands under his jurisdiction" (page 36). The term "adverse impact," however, was left unspecified.

The Federal land manager should assume an aggressive role in protecting the air quality related values of lands under his jurisdiction.

Early in 1979, the U.S. Forest Service sponsored a visibility values workshop with the intent of trying to better understand the value of visibility both in economic and psychological terms (USDA 1979). Participants included researchers, policy makers and land managers from several universities, the U.S. Department of the Interior, the U.S. Department of Agriculture and the Environmental Protection Agency. The long range research needs identified at the workshop can be grouped into three broad categories: 1) physical measurement and modeling; 2) perceptual and psychophysical; and 3) psychological and economic valuation.

The Environmental Protection Agency, in accordance with the CAA, promulgated visibility regulations which, in part, qualified the meaning of adverse impact as it relates to visibility by defining visibility impairment as "any humanly perceptible change in visibility (visual range, contrast, coloration) over that which would have occurred under natural conditions" (40 CFR, page 80086). However, no quantitative parameters were included in the definition and in the case of making a recommendation to a state under the Prevention of Significant Deterioration (PSD) program set forth in

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the CAA, the FLM would still have difficulty making a recommendation on the acceptability of a proposed new source.

Since the workshop was held, numerous studies have been conducted directed at the identified research needs. This paper presents results from studies designed to examine the perceptual aspect of visual air quality and to quantify visibility impairment. Its purpose is to propose quantitative measures of visual air quality which, in the case of a proposed new source, could be readily used by the FLM to make a recommendation to the state in a PSD scenario.

VISIBILITY IMPAIRMENT

The problem of quantifying impairment originates from the difficulty of relating a psychological measure of human visual sensitivity to haze with appropriate measures of the optical characteristics of haze. Such a task poses many questions. For example, how can human visual sensitivity be accurately measured? What measure will best describe the optical characteristics of layered haze? What measure best describes the optical characteristics of uniform haze? How can these measures be used to best portray the potential impact of a proposed new source in a meaningful manner?

Investigations of the physiological workings of the human visual system have shown that, under rigorously controlled conditions, absorption of approximately 7 photons are necessary to excite a color photoreceptor in a dark adapted fovea (Hood and Finkelstein 1986). However, visibility researchers generally acknowledge that a measure of absolute detection threshold is meaningless when examining human visual sensitivity because of numerous intervening variables such as vigilance, recognition, and search behaviors. A more practical measure of sensitivity is one of probability of detection.

A determination of probability of detection and sensitivity can proceed along several avenues ranging from simple field studies to more rigorously controlled laboratory studies. Laboratory studies are desirable because the stimulus (haze) and the salience of the stimulus with respect to other visual stimuli of a scene (background and foreground features) can be controlled. Also, several experimental techniques exist to directly measure sensitivity in a laboratory setting. These methods, based on the Theory of Signal Detection (TSD), provide techniques to derive measures of human sensory sensitivity. The measures are unbiased in terms of observer judgment of the relative "goodness" or "badness" of haze and are free of contamination from observers anticipating stimuli and guessing on its presence rather than being certain of its presence (Green and Swets 1966).

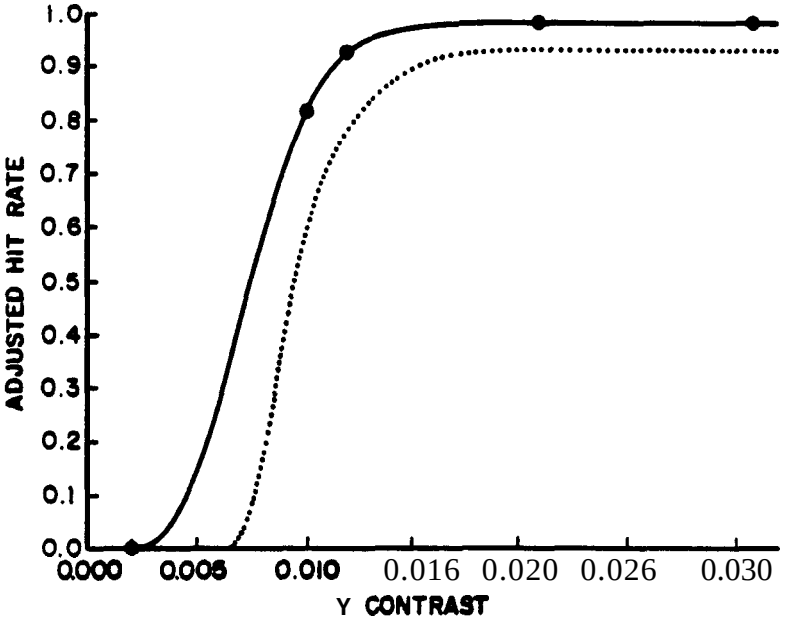
Haze can manifest itself either as a layered or a uniform haze. A layered haze typically has well defined borders and can be either elevated or ground based. A uniform haze (sometimes referred to as regional) is borderless and superimposes itself over an entire scene. Human visual sensitivity to haze is dependent whether the haze is layered or uniform. Thus, they must be considered separately.

Layered Haze

Malm and others (1986) examined visual sensitivity to square wave, or sharp edged, layered hazes using computer generated images and a Yes-No TSD method. The stimuli included layered hazes which subtended 0.09, 0.18, 0.36, 0.72, 1.44, and 2.88 vertical degrees of a 10 degree vertical viewing angle. The hazes were presented on a typical blue sky background with no foreground or background features and were darker than the background surround. Each width (vertical height) contained nine individual layered hazes which varied in intensity from a centerline, or apparent contrast, of approximately 0.005 to 0.05. Fifteen subjects were tested numerous times on each stimuli over a several day period using randomized sets of slides which consisted of images with and without the haze stimulus.

Results from the study allowed detection threshold curves to be derived for each of the widths to establish the relationship between percentage of correct responses (hit rates) and haze contrast. Once this relationship was established the percentage of times a haze of a given width and contrast would be detected and a threshold of detection could be predicted. Figure 1 shows this relationship for the 1.44" width for one of the subjects. Mahn and others defined detection threshold as the contrast which could be detected 70 percent of the time. The solid dots indicate experimental data points, the solid curve represents predicted values, and the dashed line is a lower 95 percent confidence interval on the predicted value. Seventy percent detection threshold contrast values were averaged across subjects and used to derive a sensitivity curve to depict the relationship between detection threshold and haze vertical height. Malm and others concluded that sensitivity was greatest for the layered haze which subtended 0.36" of a 10 degree vertical viewing angle and decreased as the haze became either wider or narrower. This finding was consistent with previous research on the physiological functioning of the human visual system (Braddock and others 1978).

Figure 1. Threshold detection curve for the computer generated 1.44” square wave layered haze.



Ross and others (1989) investigated human visual sensitivity to layered haze using computer generated images with a layered haze superimposed on a blue background similar to the one in the Malm and others study. This study differed from the Malm and others study by using hazes which varied in intensity across the width of the haze instead of having hazes with sharp, well-defined edges. The maximum intensity was at the center of the haze and decreased with a gaussian distribution to gradually blend into the background surround. As in the Malm study, six vertical widths ranging from 0.09 to 2.88” with nine apparent contrasts per width were used to measure sensitivity. Sixteen subjects were tested over a several day period using randomly ordered sets of images with and without the haze stimulus. Probability of detection curves were generated for each subject and each haze width. Figure 2 shows a detection threshold curve for one of the subjects. The Xs in Figure 2 indicate data points and the solid line represents predicted values. As with the Malm and others study, the detection curves were used to identify 70 percent threshold detection values for each haze width.

Figure 3 integrates results of the Mahn and others and the Ross and others studies with theoretical sensitivity curves for square wave (sharp edged) and sine wave (diffuse edged) gratings. The dashed and solid lines represent theoretical sensitivity values (Howell and Hess 1978). The open circles represent 70 percent detection levels averaged across subjects from the Malm and others study, and the closed circles are similar points from the Ross and others study. One can easily see the pattern which emerges with sensitivity being greatest for the 0.36” haze and decreasing as the haze becomes either narrower or wider. Also readily apparent in Figure 3 is that visual sensitivity is greater for layered hazes with sharp well-defined edges compared to hazes with diffuse borders. Both of these results are consistent with findings from research conducted by Henry and others (1983). One might hypothesize from Figure 3 that a new source’s predicted apparent contrast value slightly less than 0.01 might be a reasonable value for the FLM to use as a screening criteria. However, one must keep in mind that since the stimulus used in these studies contained no background or foreground features, such a value might not be reasonable in a more realistic setting.

Ross and others (1988) examined human visual sensitivity to layered haze by using slides of Navajo Mountain as viewed from Yovimpa point in Bryce Canyon National Park. The National Park Service has been monitoring visibility at this site using an automatic camera system to take photographs at 0900, 1200, and 1500 hours daily. The slides were obtained from the archives of the visibility monitoring program. A set of 15 photographs which

Figure 2. Threshold detection curve for the computer generated 0.36” sine wave layered haze.

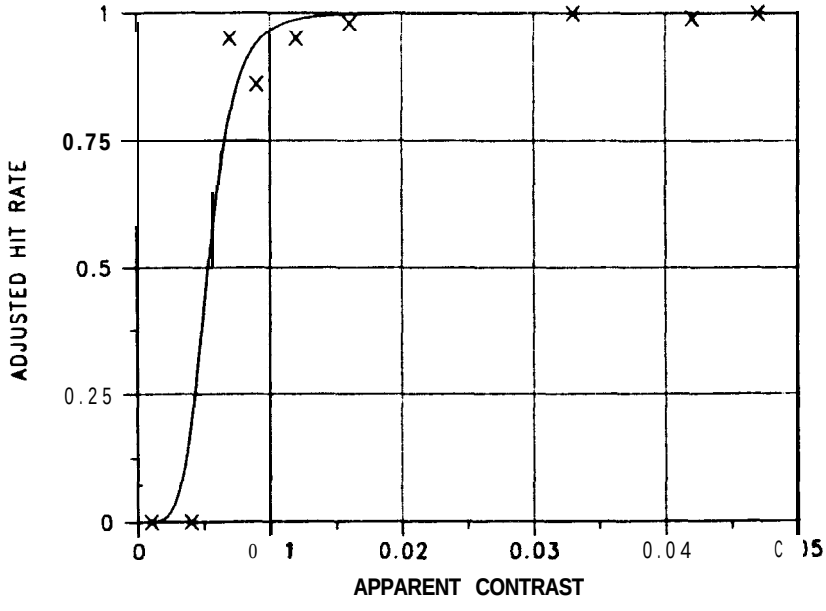
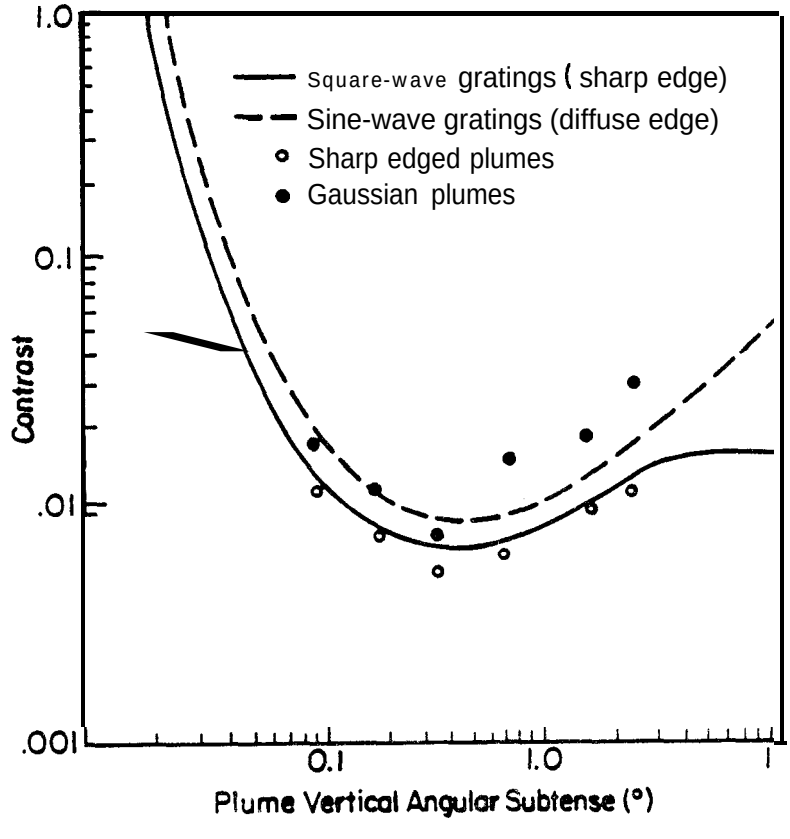


Figure 3. Sensitivity curves for theoretical sine and square wave plumes; and experimentally derived sensitivity values for square and sine wave layered hazes as a function of haze width.



contained either no layered haze, or natural light colored layered hazes-ranging in apparent contrast from 0.005 to 0.045 were selected from the files. In addition to selecting a set of slides based on a full range of contrast values, slides also were selected based on criteria such as time of day, lack of cloud cover, lack of snow cover, and overall lighting conditions. Twenty-five subjects were tested using a Yes-No TSD procedure. Figure 4 shows the results of the study. The solid line represents the best fit curve to describe the relationship between the probability of detection and apparent contrast. A 70 percent detection point for this experiment corresponded to an apparent contrast of 0.02.

The federal land manager should be aware of and fully understand the value visitors place on good visibility on the potentially affected public lands when making a recommendation to the state concerning the impact of a proposed new source.

Uniform haze

A reduction in visibility also may be manifested in the form of a regional or uniform haze. Since a uniform haze does not have distinct edges, a physical index other than apparent contrast must be used to measure the human visual sensitivity to the haze. Recently, efforts have begun to identify a suitable index which could be used to quantify the impact of uniform haze on visibility in Class I areas. Malm and Pitchford (1989) utilized a quadratic detection model proposed by Carlson and Cohen (1978) to investigate a just noticeable change (JNC) in scenic appearance as a function of atmospheric aerosol load. Malm and Pitchford concluded that while scene sensitivity to variation in light extinction (due to changes in aerosol loadings) is dependent on observer distance and background extinction levels, a change in atmospheric modulation transfer function of 0.06 constitutes a JNC for most scenic structures.

Pitchford and others (1989) proposed a strategy to prevent future and remedy existing visibility impairment due to uniform haze. The authors argue that even though a situation-specific approach would provide the best level of visibility protection, such an approach is effort intensive and probably would not be feasible in most situations. Instead, they proposed a simplistic regulatory strategy which would be able to predict current and future control levels which could be used for all areas of the country. The strategy is based on the supposition that when the visual appearance of a scene is changed by the addition of pollutants, the contrast of specific elements in the scene change.

The strategy is based on the extinction coefficient (b_{ext}), an optical parameter, rather than on pollution concentrations. The relationship between target/background contrast and b_{ext} is

$$Y=[-\ln(1-L)]/(K*X) \quad (1)$$

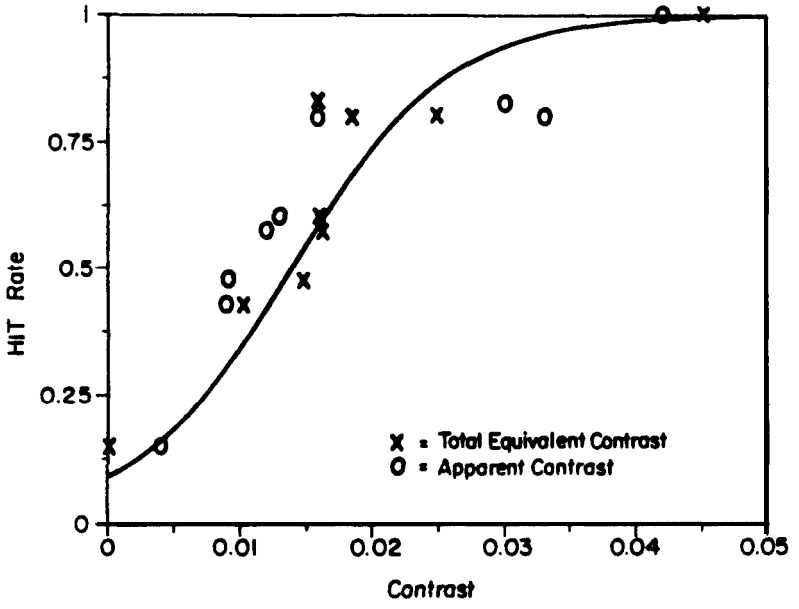
where Y is the fractional increase in b_{ext}, L is a spatial frequency dependent proportionality constant, K is a Koschmeider constant for converting visual range to extinction, and X is the range of interest from observer at the target (0) to target at the visual range (1). Pitchford and others propose that in a field application, the proportionality constant is two to five times larger than the 0.08 laboratory value. Figure 5 shows this relationship for L values of 0.16, 0.24, 0.32 and 0.40, over a 0 to 50 percent increase in extinction, and for target distances from 0 to visual range. The dotted line at the right indicates when distant targets would disappear with an increase in extinction.

In an effort to establish how much of an incremental change in extinction over a baseline was perceptible, Pitchford and others generated a set of photographs of Shenandoah National Park, Grand Canyon National Park, and Denver, Colorado which were split with the left side showing typical visibility as a baseline and the right side showing either a 10 percent, 15 percent, or 20 percent increase in extinction. Although the differences were not tested under rigorously controlled conditions, the authors concluded that a 15 percent increment in b_{ext} over baseline would be a reasonable definition of a JNC in visibility and could serve as a basis to prevent future visibility impairment.

ADVERSE IMPAIRMENT

While an apparent contrast of 0.02 and a JNC of a 15 percent change in extinction could be used by the FLM as "trigger" values in the case of a proposed new source, the final recommendation made by the FLM to the state will be highly dependent on the adversity of the projected impact. There is no specific method with which to make such a recommendation, but information can be gleaned

Figure 4. Threshold detection curve for the natural images.



from research which either directly or indirectly assesses the psychological value of good visual air quality and its importance in the recreational experiences being sought by users of public lands.

Previously, the psychological value of specific attributes (including visibility) found at Class I areas had not been well documented and the relative importance of any particular attribute was largely speculative. Recently, however, research has focused more in this direction, and knowledge about the relative importance of various aspects of a recreational experience has begun to-emerge.

Importance of Visual Air Quality

During the summer of 1983, an investigation to document the importance of good visual air quality to the recreational experience being sought in certain Class I areas began. The study was conducted at Grand Canyon and Mesa Verde National Parks and involved three data collection methods. Viewing point visitors were observed for behavior changes on days of reduced visual air quality. On-site interviews to assess awareness of visual air quality were conducted with 1,766 visitors at Grand Canyon NP and 549 visitors at Mesa Verde NP. Finally, mail-back surveys to assess the relative importance of visual air quality as a park attribute were distributed to 2,041 visitors at Grand Canyon National Park and 577 visitors at Mesa Verde National Park.

Results of that study revealed many important findings. Interview results showed that more than 80 percent of the visitors at both parks were aware of haze and their awareness level was significantly related to changes in visibility. Individual attribute ratings were statistically combined into clusters of attributes which represent general "types" of attributes. The clean, clear air attribute at both Grand Canyon and Mesa Verde NPs grouped with other attributes to form an attribute cluster which could best be described as "park cleanliness". One might surmise that cleanliness would be significantly less important than view-related attributes at Grand Canyon NP, or information-related attributes at Mesa Verde NP. Surprisingly, cleanliness was the most important type of attribute at both parks. Cleanliness was slightly more important than a view-related attribute cluster at Grand Canyon NP and much more important than an information-related cluster at Mesa Verde.

Reduced versions of the survey portion of the studies were subsequently conducted at Mount Rainier, Great Smoky Mountains and Everglades NPs. Their purpose was to validate earlier results and to assess the importance of visibility in areas

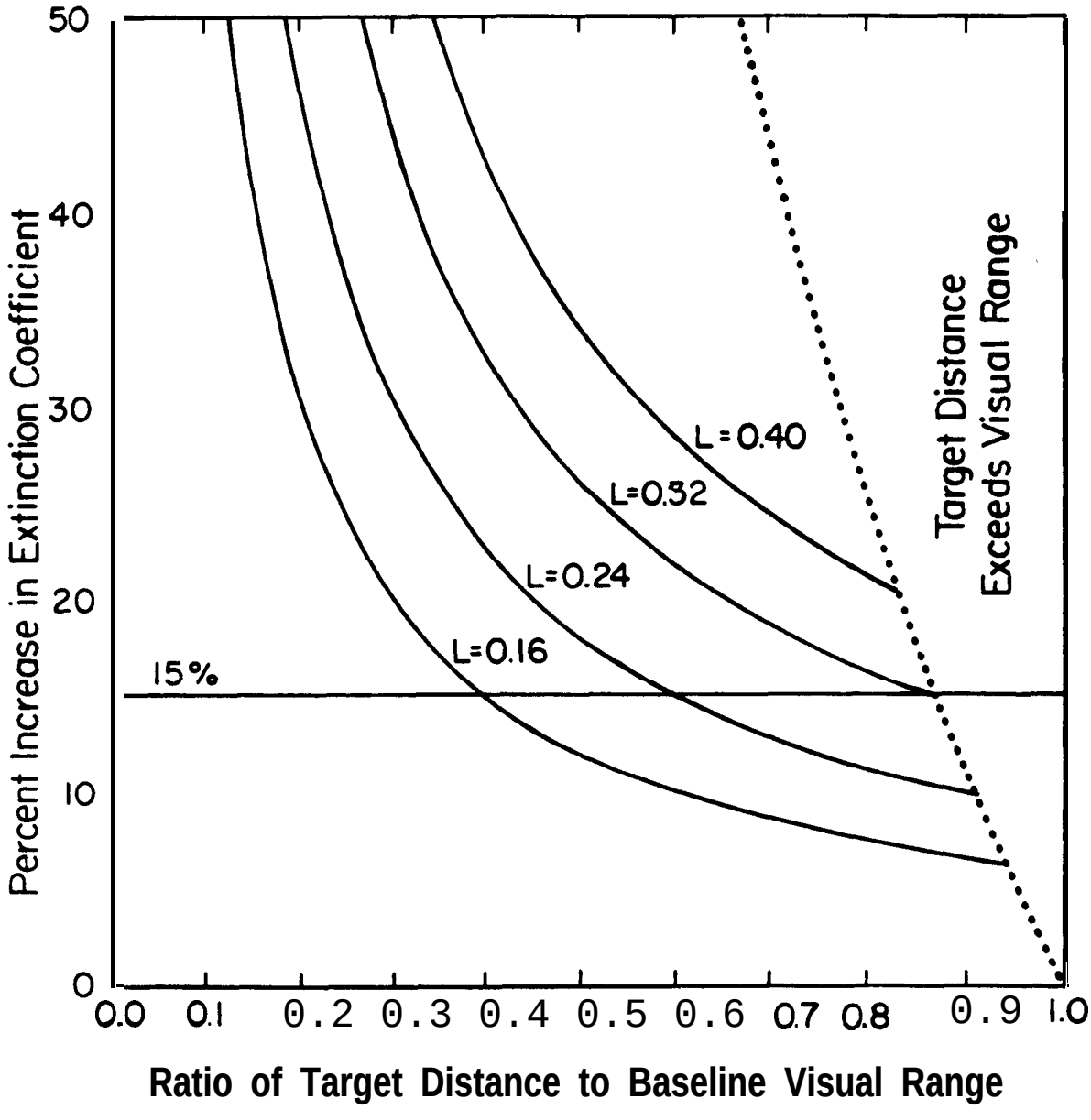


Figure 5. Uniform haze extinction curves. The extinction curves correspond to four different possible values of L appropriate to a "just noticeable change" (JNC) for a complex scene. Points below the each JNC curve represent a target distance which is to small for a noticeable change in visibility by a percent increment in extinction.

which varied widely in their underlying theme based on the types of attributes present. Results of these studies were similar to the earlier study and showed that at all parks, regardless of their underlying theme, visitors felt that cleanliness was the most important type of attribute. The relative importance of each attribute cluster at the five study sites is shown in Figure 6.

Evidence for the importance of good visual air quality has also come from other research projects. Brown and others (1977) reported that when visitors to the Indian Peaks Wilderness Area in Colorado were asked to indicate the affect of seventy-three resource attributes on their satisfaction, the attribute "clean, fresh air" was rated highest. Walsh and others (1982) found that Colorado wilderness users felt that "viewing the scenery" was the most important of 20 specific wilderness experiences and they ranked "protecting air quality" as the second most important reason for valuing wilderness. The 1988 US Forest Service annual report for the Rocky Mountain region contends that "viewing the scenery through clean, fresh air" is the most important use of Forest Service land in the region (USFS 1988).

Yuan and McEwen (1989) examined the recreational experience preferences of 560 campers in the Land Between the Lakes region of western Kentucky. The study area includes sites classified as rural, roaded, and semiprimitive using the Recreation Opportunity Spectrum (ROS) recreation area setting classification currently in use by the Forest Service and the Bureau of Land Management. Development of the campgrounds and surrounding areas varied from large modem campgrounds with showers and flush toilets, to small rustic campgrounds in semiprimitive areas. Results of that study revealed that viewing the scenery" was among the four most important recreational experiences being sought regardless of area development.

Virden and Knopf(1989) sought to determine experience and setting preferences of 1,600 recreationists in the USDI Bureau of Land Management's 135,000 acre American Flats Management area located in southwestern Colorado. The area offers settings which include four (primitive, semiprimitive nonmotorized, semiprimitive motorized, and roaded natural) of the six ROS classifications. Virden and Knopf found that regardless of the setting classification being used, "viewing the scenery" and "being close to nature" were the most important experiences being sought.

Finally, a recently completed telephone survey by the National Wildlife Federation (1989) suggests that good visual air quality will be equally important to future and current public land users. The study, which used a nationwide sample of college students, assessed concern with protection of the environment, air quality, and wilderness areas (such as parks and refuges). Survey results showed: 1) 80 percent felt environmental problems are among the three most important problems facing the United States today; 2) 23 percent indicated air pollution was the most important environmental problem; and 3) 69 percent believed that environmental quality will worsen over the next five years. In addition, 82 percent of the respondents were either somewhat or very concerned about the protection of wilderness areas.

SUMMARY

This paper proposes physical measures of the optical characteristics of haze as screening criteria which could be used by FLMs to fulfill their affirmative responsibility of protecting the visibility AQRV on public lands under their jurisdiction under the PSD section of the amended Clean Air Act. In the case of a layered haze, research on human visual sensitivity using computer generated slides with no foreground or background features has shown that sensitivity is greatest for a haze with well defined edges which subtends approximately 1/3° of a 10 degree vertical viewing angle. Sensitivity decreases as the vertical extent of the haze either increases or decreases and also decreases somewhat as the edges of the haze become more diffuse. Research on human visual sensitivity using photographs of layered haze in natural scenes suggests that sensitivity decreases somewhat when well defined foreground and background features are present. Based on results of these studies, it is proposed that an apparent contrast value of 0.02 be used as a 70 percent detection threshold to define visibility impairment in the case of a layered haze.

Research to define visibility impairment due to uniform haze is still in its early stages. However, developmental work is highly suggestive toward a just noticeable difference being defined as a 15 percent increment in extinction. Additional laboratory research may contradict this value, but until human visual perception of uniform haze is better understood, a 15 percent change in extinction appears to be a reasonable value to define visibility impairment for a uniform haze. As such, it could be used as a screening criteria for uniform haze impairment.

There is no clear cut criteria which the FLM can use to make an adversity determination. However, results of several research efforts consistently have shown that good visual air quality is an integral part of the recreational experience being sought by public land users. Clean, clear air is of primary importance to National Park users regardless of the underlying

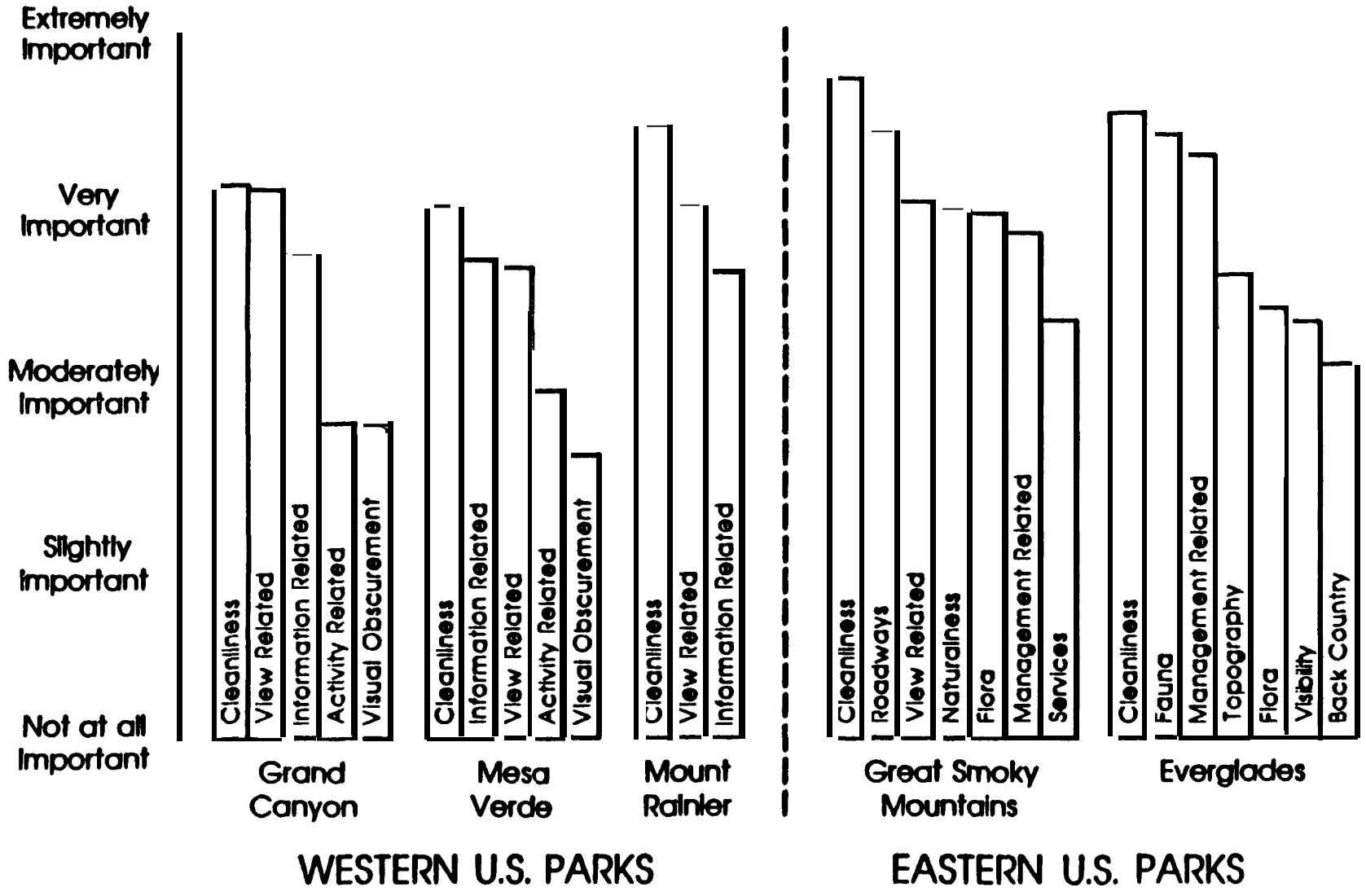


Figure 6. Comparison of mean score importance of attribute clusters for individual parks and between parks in the western and eastern United States.

theme of the park and the experiential aspect of viewing scenery through clean air is fundamental to the recreational experience of visitors to Forest Service and Bureau of Land Management lands regardless of the inherent resource characteristics of the land. The FLM should be aware of and fully understand the value visitors place on good visibility on the potentially affected public lands when making a recommendation to the state concerning the impact of a proposed new source.

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MANAGING WILDERNESS FOR EDUCATION AND HUMAN DEVELOPMENT: A BANE OR A BLESSING?

Edwin E. Krumpe'

ABSTRACT

There has been a growing trend in programs that use wilderness experience and outdoor adventure for personal growth, therapy and rehabilitation. This paper discusses the opportunities, conflicts and challenges that this growing use of wilderness has created for wilderness management. An explanatory model of how wilderness experience programs work is presented and implications for wilderness management is described. Considerations include special use permits, trip logistics, impacts of specialized activities on other visitors, safety, gradual erosion of real risk and challenge, publicity, return visitors, and philosophical differences.

THE GROWTH OF PROGRAMS USING WILDERNESS FOR HUMAN DEVELOPMENT

The purpose of this paper is to discuss the significant opportunities, conflicts, and challenges associated with managing wilderness for education and human development. The association of natural settings with meaningful and often profound human benefits has been the genesis for the national parks and outdoor recreation movement and is reflected in the mandates of the Wilderness Act of 1964. For over a century proponents of outdoor recreation and wilderness have touted the physical, emotional and even moral virtues of outdoor activity. Historically, this belief has spawned a plethora of national and international programs such as the Boy and Girl Scouts, the Civilian Conservation Corps (CCC), the Young Adult Conservation Corps (YACC), and the Youth Conservation Corps (YCC) (Hendee 1987).

Among recent expressions of belief in the value of natural environments for personal growth, development and education are worldwide outdoor adventure programs such as Outward Bound, the National Outdoor Leadership School (NOLS), South African Wilderness Leadership School, and adventure-tripping agencies such as SOBEK. There are literally thousands of outdoor experiential programs featuring elements of adventure and challenge in North America operating out of public and private schools, camping associations, colleges, and universities. Many of these programs use "wilderness" experiences as central processes in the attainment of personal development in participants (Williams and others 1989). Designated wilderness is often the setting.

Programs (and by implication their clientele) that use wilderness experience and outdoor adventure as part of their process reflect belief in the value of wilderness and the out-of-doors as a place to experience personal growth, renewal, and education.

There has been a growing trend in programs to use wilderness experiences for therapy and rehabilitation, to help victims traumatized by abuse or emotional loss, to help change delinquent behavior, to help recovery from alcohol and other chemical dependencies, to promote acceptance and adjustment to handicaps, and for many other therapeutic purposes based on the self-discovery and inspiration available through wilderness experiences. Hendee (1987) further reports that there are at least 8,850

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adventure education programs in North America, and that if environmental education programs and classes in adventure programming are included, then there are perhaps 12,000 programs. Ewert (1987) reports that managers see outdoor adventure programs on the increase and that the trend is towards managers accepting them as a legitimate use of wildlands.

All of these programs (and by implication their clientele) that use wilderness experience and outdoor adventure as part of their process reflect belief in the value of wilderness and the out-of-doors as a place to experience personal growth, renewal, and education. The objectives and methods vary from program to program, and each has its own guiding philosophy, purpose, and emphasis. Hendee further differentiates these programs based upon their emphasis upon outdoor activity skills and therapeutic or psychological activities.

> Some programs emphasize "hard skill" activities and risk, such as rock climbing, traversing snowfields and river crossings, marathon hikes and long backpacking treks or mountain climbing. Other programs emphasize "soft skill" activities such as group dynamics, problem solving and discussion, introspection, and solo experiences to promote inspiration, insight, evaluation and reflection about one's patterns of behavior, values, beliefs and motivations. (Hendee 1987, pp. 3-4)

Some Definitions

Outdoor Adventure Programs. These are programs that feature challenging trips that contain a mix of activities which utilize an interaction with the natural environment. They contain elements of real or apparent danger in which the outcome, while uncertain, can be influenced by the participant and circumstance. Outdoor adventure programs are often built around such activities as mountaineering, winter camping, sea kayaking, ice climbing, or white water float trips.

Outdoor Adventure Education Programs. These programs typically focus on education through outdoor activity or use adventure in an educational context. Classes to learn specific outdoor skills (eg. rock climbing, mountaineering, survival skills) or educational programs (eg. field biology, conservation education, natural history, wildlife ecology, oceanography) are pursued in extended outdoor trips, often in backcountry.

Personal Growth and Human Development Programs. These programs usually focus more on the mental, psychological and sociological condition and development of the participants than the outdoor adventure and outdoor education programs. They usually focus on personal growth therapy, rehabilitation, leadership, team building, creativity, competitiveness, changing delinquent behavior, or recovery from alcohol, chemical or emotional dependencies.

It should be pointed out that these are not mutually exclusive categories but rather three different focuses that wilderness experience programs tend to accentuate. Often, any given program may include some elements of one or both of the other categories. However, all of these programs maintain that their primary focus involves more than just pursuing recreational activities and experiences in a wilderness setting.

AN EXPLANATORY MODEL OF HOW WILDERNESS EXPERIENCE PROGRAMS WORK

Although there are perhaps as many purposes, methods, and philosophies to enhance personal growth as there are wilderness experience programs, Hendee and Brown (1987) have proposed an explanatory model of how wilderness experience programs work for personal growth, therapy and education. They begin with four broad postulates.

Receptivity

First, personal growth from a wilderness experience depends on the participant's receptivity. Participants come to the wilderness in varying stages of receptivity to change which may depend on conditions preceding the experience. People already struggling with deficiency needs or who are already striving toward self-improvement are likely to be receptive to personal growth. Many wilderness experience programs are tailor-made to attract such participants.

Optimal Stress

Second, personal growth depends on the right degree of stress from the wilderness experience--physically and psychologically. This threshold varies with the physical condition and previous experience of each individual. Participants discover that the natural environment offers physical and psychological stress from dealing with the rigors, discomfort, danger, and uncertainty of outdoor experiences. Many people believe that the greater the natural environment intensity and the harder it is to access and enjoy the environment, the greater is the potential for personal growth. However, each person has his or her own

unique threshold of tolerance for intensity of contact with the natural environment, which must not be crossed if the experience is to be positive and productive. Generally, wilderness programs utilize the natural environment in concert with programmatic techniques to create just enough stress with which the individual can cope, but to offer sufficient challenge to bring core behavior and psychological patterns into awareness where they can be identified, clarified, and evaluated and redirected if desired (Hendee and Brown 1987).

Contrast and Attunement

Third, wilderness experiences provide a reprieve from cultural influences, external constraints and stimuli, providing a change of pace and the opportunity for focus and attunement to oneself and the immediate environment (Hendee and Brown 1987). People are increasingly a product of a fast-paced technological society with increasing demands on their time, often characterized by hectic, intense, demanding, unrelenting pressures at work, in school, and even in their social lives. Escape and stress release is one of the most common motives for wilderness visitation (Manfredo and others 1983; Hammitt 1982). In wilderness experience many find a liberation from the external forces that control their daily lives. Confronted with the challenges of the natural environment as they make their way in the wilderness, powerful societal pressures from peers, supervisors, and even chemical dependencies are soon relegated to a much lesser significance. Fellow participants are soon seen as equals when facing the challenges of the out-of-doors.

With this liberation from the patterns of our daily lives, latent feelings, emotions, and physiological functions may emerge and new perspectives may emanate. Many wilderness experience programs take advantage of the fact that liberation from a predominantly left-brain analytical orientation in participants' daily lives may clear the way for the creative, visualizing and intuitive functions of the right brain to emerge (Hendee and Brown 1987). In the wilderness setting, people have an unparalleled opportunity for attuning to themselves and to the natural world. The argument is made that, "In wilderness, we can experience, once again, the true significance of our own lives in relation to the natural order. This experience, of seeing ourselves in true perspective, both humbles and empowers us" (Hendee and Brown 1987). To varying degrees, a majority of the programs utilizing wilderness for human development take advantage of the opportunities to provide change and athmement afforded by activity in natural environments.

Metaphorical Experiences

Fourth, wilderness experiences and activities can provide metaphors that heighten our awareness of, desirable qualities we can develop for application back home in our daily lives (Hendee and Brown 1987). Many programs, such as Outward Bound, build upon the simple metaphor that from success in dealing with stress from the environmental intensity of the experience, comes the associated discovery of previously-untapped resources, and a sense of accomplishment. A common programmatic goal is to provide the optimum stress from the wilderness environment so as to provide real challenge but also to allow for successful coping. Probably the most complete treatise on how outdoor program metaphors can be effectively used is ***The Conscious Use of Metaphor in Colorado Outward Bound*** (Bacon 1983).

In summation, the Hendee and Brown (1987) model of how wilderness experience programs work for personal growth, therapy and education proposes that a continuum of personal growth-related effects may derive from wilderness experience programs depending on: (1) the participant's receptivity prior to the experience; (2) optimum stress from the environmental intensity and physical activity in the program; (3) contrast to the participant's daily life in reduced external stimulation and opportunity for athmement to self, the environment and companions; and (4) metaphorical experiences during the wilderness experience program which may apply to the individual's daily life back home. Participation in these programs allegedly result in: (1) increased personal and (2) social awareness, leading to (3) a "growing edge" where core patterns of behavior, values and beliefs can be evaluated by the participant with the benefit of (4) inspiration from primal stimuli of the wilderness environment and experience (Hendee and Brown 1987).

IMPLICATIONS FOR WILDERNESS MANAGEMENT

Special Use Permits, Outfitting, Guiding, and Concessionaires

Special use permits are required for use of Federal lands for any outfitters holding themselves out to the public for hire for money or barter. On Forest Service lands special use permits are issued according to carrying capacity constraints. Generally, commercial permits are based upon (1) proof of liability insurance including provisions that indemnify the land agency from law suit, (2) an acceptable operating plan that documents procedures, competencies, and resource protection, and (3)

payment of a percentage of gross revenues to the agency.

Up until 1984, the Forest Service and BLM issued "educational permits" for non-profit educational institutions and organizations. These types of permits have since been renamed semi-public outfitting permits and apply to almost any organized or guided use that is not licensed commercially, including scout and church groups. The requirements included for these permits are the same as for commercial permits, except that the fee is slight and, if tax-exempt, no fee may be assessed. Most states also have regulations pertaining to use of public lands. One of the most stringent in terms of regulating outfitting is Idaho where there is a dual process of regulation as outfitters are also licensed by the Idaho Outfitters and Guide Board. Such outfitter and guide boards generally pay greater attention to issues of adequate training of guides, whereas federal permits place greater emphasis on insurance and liability than guide training.

Trip Characteristics and Logistics

Experiential programs usually bring larger parties than private user parties. Programs for people with special difficulties often require a very high leader/client ratio. It quickly becomes difficult and expensive to offer trips with small numbers of participants. In addition, many groups may prefer to keep using the same travel routes and campsites. This results from familiarity with the resource and programmatic needs for specific terrain or natural features. The research on recreational impacts in backcountry clearly shows that larger parties and parties that stay for extended periods have disproportionately more impacts than small groups of individuals that move their campsites frequently (Hammitt and Cole 1987). Organized groups also frequently request permission to set up drop (or spike) camps with supplies and provisions to facilitate longer stays in the wilderness. The Forest Service normally denies requests for food caches in the Wilderness.

Impacts of Special Activities on Other Visitors

Special activities are often required by wilderness experience programs that may have both physical and mental impact on the wilderness and upon other wilderness users. High ropes courses, obstacle courses, and rappelling courses concentrate use and can cause impact or damage to the natural environment. Support structures left behind between courses detract from the pristine qualities that other users expect to find in wilderness. Solo experiences, survival activities and harvesting edible wild plants and animals also may cause undesirable impacts. Some programs require participation in group sessions that can increase impacts and detract from the wilderness experience of other users. Encounter groups, primal screaming, chanting, body passing, role playing, pantomime, and other group therapy techniques may seem strange or inappropriate to non-participants who may happen upon them in a wilderness setting.

Safety and Search and **Rescue Requirements**

An additional issue is the increased possibility of accidents resulting from participation in high adventure experiential programs. Potential problems include the cost and the danger to personnel and others involved in rescue operations and the impact that frequent helicopter or other motorized rescue operations can have on other wilderness visitors.

On the other hand, experiential programs can be a benefit to land managers. These programs may also provide support services to land managers, both logistically and with highly skilled instructors who are trained and available for volunteer support in search and rescue.

Sometimes an inordinate amount of emphasis is placed upon client safety for experiential programs. This is partly because in many programs the clients are affected by some disadvantage, such as a physical, mental or emotional impairment. The concern is that they may be less capable of looking out for their own safety than the routine wilderness visitor. Virtually all of the outdoor program leaders that I talked with were also seriously concerned with issues of legal liability. They cited the growing trend of the public to sue for any kind of injuries or damages and the exorbitant insurance premiums demanded to insure their programs.

Gradual Erosion of Real Risk and Challenge in Wilderness

Those visitors pursuing outdoor adventure will demand the opportunity to seek risk, challenge, the opportunity to test their skills, to push themselves to their personal limits. Regulations regarding personal safety, assigned campsites or travel routes, or development of facilities such as trails, bridges, fire pits, and so forth will serve to detract from their outdoor adventure experience.

Driver and Brown (1984) have suggested that people with different motives and expectations for recreation participation will prefer different environmental settings. It follows that managing resources along strictly outdoor recreational lines to

minimize risk invites a displacement and inequity of resource allocation for the adventure recreationist (Knopf and Schreyer 1985). Attempts by managers to reduce or interfere with the challenge and risk-taking potential of an area may severely inhibit the potential for satisfaction for this outdoor adventure user. Sax (1980) further suggests that there will be an "erosion" of risk and spontaneity in the outdoor resources that ultimately will attract those users seeking a risk-free enviromnent.

The public trend towards suing for injuries has forced outdoor experiential programs to place an inordinate emphasis on safety in their programs. This has fostered the growth of the Association for Experiential Education in Boulder, Colorado, which demands high safety standards among its 1,430 members and which publishes manuals, based upon peer standards, on how to operate without injury in outdoor programs. In the July 1989 issue of USAIR magazine, Dan Garvey, the association's director is quoted as saying, if properly done outdoor programs "are safer than summer camp."

The trend today is that safety and responsibility is assumed by the vendor. Participants hardly even have to take responsibility for their own safety. There is a concern that this high emphasis on safety is resulting in a gradual erosion of real risk and challenge in wilderness experiences. People participating in such programs have come to expect the highest degree of safety. In doing so, they cease to take real responsibility for their actions and welfare in the wilderness--hardly what the framers of the Wilderness Act would have envisioned.

What better way to promote resource stewardship than to have people recharged and renewed in their commitment to their fellow man and to the magnificent wilderness resources with which our country is so amply blessed.

Publicity and Its Implications

Along with the tremendous growth in popularity of wilderness experience programs there has been a concomitant growth in two kinds of publicity. First, literally thousands of programs use wilderness in their advertisements, brochures and videos. Many specifically name Wilderness areas and sometimes even key locations within them. Second, there is increasing coverage of wilderness programs in the mass media. Magazine and newspaper articles, as well as television news coverage, often are attracted by the seemingly remarkable accomplishments in personal growth and development that are provided by programs which take physically or emotionally impaired individuals into the wilderness. In addition, the mass media is also quick to cover any occasion of injury or personal tragedy which may occur during wilderness programs.

Some wilderness managers are concerned that both kinds of publicity tend to advertise wilderness. This is viewed as undesirable to the degree that such "advertising" may promote increased use of already over-used areas or attract unqualified thrill seekers. Another concern is that such media and publicity seldom includes information about the purpose and philosophy of wilderness, nor about low impact camping and travel techniques or appropriate visitor behavior. Thus, although proper media attention may serve the purpose of public education, it may also serve to concentrate users and increase impacts.

The Return Visitor

Another concern of wilderness managers is that wilderness experience programs tend to engender a high return rate among participants for subsequent wilderness trips on their own. The concern is not for those who had participated in a wilderness experience program which taught camping and wilderness travel skills. Rather, many experiential programs are completely outfitted and tend to focus on the personal growth and human development aspects and offer little training in wilderness travel and camping skills. Frequently, return visitors bring other people along who have little or no wilderness camping experience. Also, former participants may try to duplicate some of the adventure program activities, such as ropes courses or rappelling, with inadequate training or equipment. These are areas of concern with return visitors. For these reasons, return visitors may have adverse impacts on the wilderness.

On the other hand, it can be argued that if wilderness adventure programs are conscientious in the education and skills they impart to their clients, then the return visitors will be better equipped and better able to have minimal impacts on the wilderness. Wilderness managers would be wise to encourage wilderness experience programs to impart such knowledge.

Philosophical Differences

There is one final philosophical concern with groups who use wilderness for education and human development. All of the outdoor adventure, outdoor education, and human growth and development programs follow a rather carefully planned itinerary of outdoor activities and therapeutic and psychological activities which build upon each other to affect or influence the participants in a planned way. While critics may not deny the positive effects and value these programs may have upon the participants, such highly structured events conducted with groups in the wilderness seems to be the antithesis of the Wilderness Act ideal--where earth and the community of life are untrammeled (uncontrolled) by man, where there are outstanding opportunities for solitude or a primitive and unconfined type of recreation. Of course, the same criticism could be leveled at many outfitted activities in wilderness and wild and scenic rivers in America. But the underlying concern with outdoor adventure and therapeutic programs is that participants in some of these programs may potentially lose the personal freedom which has been a hallmark of wilderness.

Can It Be Done Elsewhere?

One of the basic principles of wilderness management is that those activities which are wilderness-dependent should be favored (Hendee and others 1978). It can be asked, can wilderness experience and adventure programs be done elsewhere? Obviously, at least some of the activities and techniques can indeed be done elsewhere. In Boston, Chicago, Seattle, and many other large cities, health clubs and gymnasiums are building sophisticated climbing walls from 10 to 65 feet high. These walls come replete with cracks, ledges, overhangs, handholds and fixed repelling and belay points. Some of these climbing walls replicate actual routes on famous climbs and many can easily be changed or modified to suit the needs or demands of the "rock climbers." Climbers can easily seek various levels of challenge and risk. Arguably, the use of such facilities for initial training could lessen the need to pursue these activities in actual wilderness. As for the personal growth aspects, some would argue that the counselling routines can be conducted just as well in a meeting room or a clinic. The counter argument from both the provider of these services and from the thousands of clients they serve is that programs which draw upon the rich and varied natural phenomenon found in outdoor settings are really quite different.

Should It Be Done Elsewhere?

Wilderness management decisions should be driven by the mandate to protect the wilderness resource, perpetuate natural processes, and to provide for human benefits. In wilderness, the greatest human benefits ultimately accrue from perpetuating naturally functioning ecosystems. Therefore, programs which (1) do not depend upon experiencing natural pristine conditions, and (2) which cause impacts to the wilderness resource (both physical and psychological) should be encouraged to go elsewhere.

On the other hand, those programs which take advantage of the naturalness of primeval wilderness influences and which do not detract from the wilderness resource should be welcomed. What greater use of the wilderness resource could be made than providing for healthy minds and bodies--inspired, healed, and restored by experiences in the natural environment. What better way to promote resource stewardship than to have people recharged and renewed in their commitment to their fellow man and to the magnificent wilderness resources with which our country is so amply blessed. Muir, Thoreau, Leopold and others have eloquently proclaimed the benefits and lessons to be learned from letting the wilderness seep into our very soul. Programs that take advantage of this healthy, healing, restorative power of the wilderness probably cannot be done elsewhere, or at least not as well.

In conclusion, there has been a steady growth in programs which use wilderness experience and outdoor adventure for personal growth, therapy and rehabilitation. While managers often recognize that participants in these programs may receive a tremendous experience, they have expressed concern that many of these programs may cause an inappropriate type or inordinate amount of impact. To the degree that adventure or therapeutic programs cause such impacts, they will be considered a bane. However, to the degree that these programs teach and espouse appropriate back country procedures, they should be considered a blessing because ultimately the success of wilderness management depends upon the public understanding and using the wilderness in an appropriate manner.

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HORSES, HELICOPTERS AND HI-TECH: MANAGING SCIENCE IN WILDERNESS

David J. Parsons and David M. Graber'

ABSTRACT

Scientific research and monitoring are essential to assuring the continued preservation of wilderness. Understanding the spatial and temporal variability of natural ecosystem processes and human induced stress and disturbance is necessary in developing and carrying out wilderness management programs. Impacts associated with scientific activities, like those commonly associated with wilderness use and management, must be carefully weighed against the benefits to be derived. Where possible and appropriate, manipulative and experimental research should be carried out outside of wilderness boundaries. Where the required information must be acquired within the wilderness, impacts and mitigation actions should be carefully documented.

INTRODUCTION

A principal value of wilderness is the opportunity it provides to understand basic ecological principles, including the dynamics of undisturbed ecosystems. For millennia, wilderness ecosystems have adapted to slowly changing environments, virtually uninfluenced by human populations. Today, these ecosystems are faced with a myriad of unprecedented human induced stresses: alien species, air pollution, visitor use impacts, low flying aircraft, suppression of natural fires, and most recently, the threat of significant climatic change due to greenhouse gas emissions. If we are to preserve the very values for which wilderness is created we must understand the nature and mitigate the effects of such stresses.

Whereas the term "wilderness management" may appear to some as a contradiction, managing wilderness can no longer be avoided. Some form of hands-on management, however gentle, is necessary to assure the perpetuation of wilderness and its associated values. Scientific studies, be they research or monitoring, are required to provide the information necessary to direct and evaluate that management. The physical, biological, **and** aesthetic impacts of conducting science may be small compared to the ultimate cost of not acquiring that information, but in any case are a necessary cost of assuring protection of a wilderness area as well the long term survival of planet Earth.

Wilderness managers constantly must address the question of what extent the impacts of scientific research and monitoring will be accepted in order to assure the continued protection of wilderness. How should these often easily quantifiable, short term impacts be weighed against longer term benefits? Different societies, agencies, organizations, and individuals may answer that question in different ways.

HISTORICAL PERSPECTIVE ON SCIENCE IN WILDERNESS

Our concepts of wilderness historically have been shaped by a perception that natural ecosystems are highly stable, homogeneous units, representing a "balance of nature" (Christensen 1989). We now recognize that such models are badly flawed. Natural ecosystems, what we generally aim to preserve in wilderness, are instead dynamic landscapes in which natural disturbance creates a changing mosaic of species and communities. This "patch dynamic" model has helped us to recognize that disturbances such as fire, wind, or drought are often an intrinsic part of wilderness ecosystems (Christensen 1989). The idea that wilderness provides an opportunity to preserve a "snapshot" of the past has been largely replaced by the realization that native ecosystems are ever-changing entities. Wilderness management objectives now largely feature "protection of the natural processes that have

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shaped the physical-biological character of the setting" (Stankey 1987).

To minimize the impacts of human activities we must first systematically determine the nature and effects of those factors, both natural and human induced, that influence the structure and processes characterizing wilderness ecosystems. For example, the 1988 Yellowstone fires, popularly characterized as destructive or catastrophic, have been found through scientific studies to have very nearly replicated similar events that have occurred every 200 to 400 years in that area (Christensen and others 1989; Romme and Despain 1989). Thus, such events may actually have a valid role in preserving the wilderness character of the region.

The physical, biological, and aesthetic impacts of conducting science may be small compared to the ultimate cost of not acquiring that information.

Despite the fact that The Wilderness Act (Sec. 4(b)) specifically recognizes the scientific values of wilderness, these values have, for the most part, not received the same emphasis as have cultural and recreational values. Franklin (1987) has argued that too little scientific use of wilderness has occurred and even less attention has been given to scientific values in wilderness management planning.

This situation contrasts sharply with the attitudes and policies of at least one other world power. The Soviet Union possesses a network of preserves ("zapovednik") long closed to all entry except approved scientific study. These include some of the finest biological assemblages in the U.S.S.R. The zapovedniki are experiencing increased use by international as well as Soviet scientific groups.

SCIENTIFIC USE OF WILDERNESS

The use of wilderness for scientific study is justified on several levels. First, research designed to provide an understanding of a specific ecosystem, including the variability of system properties in time and space, is necessary if we are to have any hope of detecting and mitigating unnatural changes (Graber 1988). This type of research, which provides the basis for managing individual land units, might include resource inventories as well as studies of the local effects of fire suppression, alien or extirpated species, or visitor impacts. Such research may result in the development of models to explain how the natural ecosystem functions; followed by monitoring to determine if the system is behaving as predicted. Other studies may lead to the formulation of specific management or mitigation strategies. A second class of research in wilderness contributes to society's need to understand the planet. The use of unperturbed sites to carry out basic ecosystem studies and develop models of how the natural world works will provide benefits to society far beyond the boundaries of the areas studied (Stankey 1987; Graber 1988). Studies of vegetation and watershed response to air pollution or global climate change fall in this category. Finally, Graber (1988) has argued that balanced use of wilderness must also permit scientific study "for its own sake" so long as the resource costs are commensurate with other wilderness uses.

Specific examples of scientific use of wilderness range from measuring baseline conditions to analyses of physical, biotic and human interactions (Lucas 1986). Studies of the effects of visitor practices and use levels on campsites, trails, and the perception of crowding have led to the development of guidelines for minimizing impacts (Cole 1989a), inventorying and monitoring the condition of resources (Fox and others 1987, Cole 1989b), and developing user capacities (Stankey and others 1985; Parsons 1986). Other studies have focused on fire, air quality, soil, vegetation, fish and wildlife, aquatic resources and user characteristics and attitudes (see Lucas 1986 for examples).

IMF'ACTS OF SCIENCE

Whereas some kinds of scientific data can be collected unobtrusively - observation, photography, or satellite imagery - other kinds impose an impact on the land. Scientific paraphernalia may include stakes in the ground to mark permanent plots, tags or flagging on trees, stream gauges, weather stations, radio repeaters and air quality samplers. Some of these cause physical impacts (e.g. nails in trees, masts and guys driven or even concreted in the ground); others simply create a visual intrusion. Other types of data-gathering require destructive collection of plants, animals, or soil. Cores removed from trees may be required to determine growth rates, toxic element concentrations or fire scars. Blood or tissue samples from animals may be required to evaluate health. Disturbance of fauna and trampling of sensitive vegetation in the course of carrying out detailed plot work are other examples of direct impacts of science.

The potential impacts of carrying out scientific studies also include transport of equipment to and from the study site. Helicopters and pack stock (horses, mules, or llamas) are typically the only options for transporting heavy, bulky or sensitive material. The scenic, biological and physical impacts of such modes of transport must be weighed against the benefits to be derived from the studies. In some cases it is necessary to weigh the relatively transient aesthetic impacts of using a helicopter against the longer lasting impacts caused by the trampling and grazing of pack stock.

New, less intrusive technologies, such as remote sensing, global positioning devices, micro-circuitry to sense changes in body or soil temperature, and satellite data transmission, hold much promise for reducing future impacts.

The appropriateness of experimental studies in wilderness must be evaluated case by case. Sometimes experimental work can be conducted just as successfully outside of designated wilderness. Where there is reasonable doubt whether findings can be accurately extrapolated to the wilderness in question, consideration should be given to permitting the studies. The contribution of the proposed research toward preserving wilderness integrity must be weighed against expected impacts. Examples of experimental studies that are justified in some wilderness settings include in situ or chamber fumigation of native flora with ozone or sulfur dioxide, experimental burning under varying prescriptions, and small scale acidification of streams or microcosms in lakes. The use of radioactive tracers and the simulation of large scale disturbance should be avoided in most cases. Proposals for the taking of specimens of rare species to complete collections, evaluate health, or support captive breeding programs must be dealt with cautiously.

On the other hand, scientists working in wilderness must also be concerned over the threats of recreation and management intrusions on the scientific values of wilderness. Improper use and management practices can pollute water, harass wildlife, or introduce alien species, detracting from the value of a wilderness as a baseline against which to measure change.

THE MANAGEMENT DILEMMA

The wilderness manager is continually faced with the need to make sensitive decisions regarding the appropriateness of various activities and associated impacts. Tradeoffs between the benefits to be gained (from increased recreational opportunity or enjoyment, resource protection, scientific knowledge) and the resulting impacts (vegetation trampling, soil disturbance, scenic encroachment, user conflicts) must be carefully weighed and evaluated. In the case of research and monitoring, consideration should first be given to the potential value of the proposed study and whether the work needs to be done within wilderness boundaries. If it is determined that the study is desirable, a plan to mitigate expected impacts should be developed. Mitigation may include careful siting of equipment to minimize visual intrusion, the timing of activities to avoid high visitor use periods, use of nondestructive sampling methods, or even exploiting the work for interpretation and education. For example, nondestructive sampling methods now exist for dating living, fire-scarred trees to develop fire chronologies (Sheppard and Lassoie 1986). The better informed people are about wilderness management practices, including the need for research, the more likely they are to understand and tolerate the associated impacts (Kantola 1976; Taylor and Mutch 1986).

Wilderness areas are fast becoming the only places where it is possible to study largely unmodified ecosystems.

Whereas the image of wilderness may be the absence of signs of technological man, there are many activities carried out in wilderness that are allowable within the Wilderness Act. These include such mandated uses as recreation and. its associated management programs, permitted pre-existing uses (such as grazing or mining), or in some cases, subsistence hunting and gathering. Each of these activities comes with its own suite of impacts. Recreational use of wilderness requires trails, bridges and signs. Visitors build fire rings, burn scarce wood, pollute water, leave trash and disturb wildlife. Pack and saddle stock consume forage, trample meadows and streambanks, and erode trails. If such impacts are to be permitted for these uses, the stakes, tags, snow gauges and telemetry stations used for research and monitoring must be judged using the same criteria.

The weighing of the generally short-term impacts of conducting science against the longer term benefits to wilderness preservation must be done carefully and systematically. It is the responsibility of the scientist to present the options for carrying out a specific study. This should include the potential benefits of acquiring the data as well as the consequences of not doing so. The manager must then weigh the costs and benefits and make a

decision as to how important the information is to the protection of the area and the preservation of wilderness as a whole. The manager also has a responsibility to articulate guidelines for appropriate use by scientists (Stankey 1987). These should address the appropriateness of various types of scientific activities, including such items as the identification of mitigation strategies and the responsibility to remove stakes, tags, and other paraphernalia at the conclusion of a project.

AN EXAMPLE OF A MANAGEMENT PROGRAM

In Sequoia and Kings Canyon National Parks (including over 290,000 ha of designated wilderness in the southern Sierra Nevada of California) a system has been developed to evaluate and document the impacts of proposed scientific as well as management actions. All projects with the potential to impact natural, cultural, or aesthetic resources are reviewed by the Parks' Environmental Management Committee, which then makes recommendations for approval or disapproval to the Superintendent. Consisting of a cross section of high level management, the Committee reviews each project proposal, including a full description of proposed activities and an environmental impact matrix identifying all potential impacts as well as any proposed mitigations. The Committee determines the potential for significant environmental impact and compliance with law and regulation, particularly the 1969 National Environmental Policy Act (NBPA) and the 1964 Wilderness Act. The Department of Interior interprets the NEPA "categorical exclusion" authority to include "non-destructive data collection, inventory, study, research and monitoring activities". National Park Service Policy further interprets it to include "day to day resource management and research activities". Should the Parks determine that a proposed project fails to qualify for a categorical exclusion, an Environmental Assessment or Environmental Impact Statement is required.

In Sequoia and Kings Canyon National Parks this review process has led to the approval of proposals to core trees (long-term tree health concerns), gauge stream flow (primarily aesthetic concerns), use stakes and tags to mark permanent plots (both aesthetic and tree health concerns), collection of specimens (population viability concerns), dig soil pits (archaeological concerns), and erect a scaffolding into the canopy of trees to conduct ozone fumigation and plant physiology experiments (safety and aesthetic concerns).

CONCLUSIONS

Wilderness in the United States is likely always to be managed from a largely multiple use perspective. Legal and ethical guidelines recognize scientific study as one of many valid uses. In fact, the Wilderness Act, while providing substantial constraints, specifically provides for research appropriate to or necessary for the protection of wilderness. In order to preserve the wilderness character of an area it is first necessary to understand its condition and the threats it faces. In fact, it could be argued that the conduct and accoutrements of science are equally--if not more--necessary to meet the minimum requirements of wilderness protection than are many routine management actions. If we can't assure the continued survival of an area in its natural state we will no longer fulfill the purpose of wilderness designation. It is thus essential to understand the nature and effects of natural fire regimes, pests, air pollution, and other natural and unnatural stresses, including their spatial and temporal variability. It must be remembered that wilderness is not a museum where species and communities are put on display. It is a dynamic, ever changing entity that is shaped largely by natural processes, unimpeded by human activities (Christensen 1989).

Wilderness areas are fast becoming the only places where it is possible to study largely unmodified ecosystems. Thus their value to science in understanding unaltered landscapes will only become increasingly important. Yet, it must be recognized that science does not come without its costs. These must be evaluated in terms of relative impacts and benefits on a case by case basis. Both the wilderness manager and scientist have responsibilities to assure that costs and benefits are fully evaluated. Decisions must be justifiable and well documented. Mitigation measures should be identified and carried out wherever appropriate. Similarly, the conduct of science in wilderness provides an excellent opportunity for education. The opportunity to explain the factors influencing natural ecosystems will assure a more knowledgeable public and should eventually help assure more enlightened management direction. When such steps are followed science becomes one of our principal tools in assuring the future preservation of wilderness.

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MANAGING FOR COMPATIBILITY BETWEEN RECREATIONAL AND NONRECREATIONAL WILDERNESS PURPOSES

Patrick **Reed and Linda Merigliano'**

ABSTRACT

Wilderness serves a number of public purposes, including both recreational and nonrecreational. As with any multiple-use resource management, these purposes may conflict. Potential areas of conflict among recreational and nonrecreational wilderness uses and three basic management strategies for resolving conflicts are discussed, with an emphasis on practical extensions of the Limits of Acceptable Change (LAC) system.

INTRODUCTION

As a natural resource management challenge, wilderness is perhaps the most underrated. To some extent, difficulties result from inadequate operational funding and the effects of external land use impacts and pressures. The roots of the challenge, however, go back further, to the 1964 Wilderness Act itself, and the full extent of the challenge has probably yet to blossom.

The Wilderness Act describes wilderness as "an area where the earth and its community of life are untrammeled by man" (Section 2c), and also as an area "devoted to the public purposes of recreational, scenic, scientific, education, conservation, and historical use" (Section 4b). It is this composite description that forms the basis for potentially conflicting ***preservation*** and ***human use*** purposes in wilderness management, conflicts which at times are only further complicated by the policies of other applicable Federal statutes.

By virtue of the undeveloped and often perceived "unproductive" character of wilderness, federal agencies and the public have often acted as though no special attention is required to manage wilderness. Similarly, wilderness management and research have received comparatively little attention and funding within the federal agencies which administer wilderness.

In a somewhat analogous way, members within the "wilderness community" have also taken an unnecessarily narrow view of wilderness management, falling into what Kelly (1989) calls the "recreation trap." Because it is easier to define and observe, and often the subject of much of their training, wilderness managers have for the most part concerned themselves with recreational use. Researchers, too, have measured and described the numbers, patterns, motivations, preferences, and satisfaction of recreational users, including conflicts stemming from incompatible recreational purposes, number of encounters, management activities, and other causes. Particularly within the Forest Service, little attention has been given to the other nonrecreational purposes of wilderness.

Because wilderness has multiple purposes, there is always the potential for conflicts to develop among its different users by virtue of their different associated activities and practices.

Not surprisingly then, little attention has been given to potential conflicts between recreational users and other "nomecreational" users of wilderness and their accompanying practices--scientists, archaeologists, educators, and other visitors interested in uses such as spiritual development, for the preservation of wild places purely for preservation's sake. Yet, public interest will soon demand that more attention be given to nonrecreational uses of wilderness, thereby

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elevating the management challenge to its full potential. Managing for all the uses of wilderness will necessitate new ways of meeting conflicting demands on the wilderness resource.

It is not our purpose in this paper to argue either in favor of recreational use or nonrecreational use of wilderness, per se. Neither is it to create an undue sense of competition between the two categories of use, nor to promote a practical dichotomy of the two. Our intent is to address the need and opportunities to more fully integrate recreational and nonrecreational purposes in wilderness management. Basic to this is the observation that recreational use may at times be compatible with other equally appropriate wilderness uses and at other times be incompatible, just as one type of nonrecreational use also may be compatible or incompatible with another nonrecreational use. Accordingly, it is also our intent to describe how to minimize potential conflicts between recreational and nomecreational uses through several basic management strategies involving wilderness managers from the field to the national level. In particular, the potential capability of the Limits of Acceptable Change (LAC) system for managing nonrecreational wilderness uses is highlighted. While this paper will address nomecreational wilderness purposes as identified in the Wilderness Act (that is, scientific, educational, conservation, and historical), it will not include nonrecreational, "nonconforming" wilderness uses such as domestic livestock grazing and mining.

WILDERNESS PURPOSES

As originally conceived, and as implemented by the Wilderness Act, designated wilderness has several characteristics and multiple purposes. The characteristic which most directly concerns recreation use is described in the statement that "wilderness has outstanding opportunities for solitude or a primitive and unconfined type of recreation" (Section 2c). Indeed, wilderness is duly renowned for its recreation experiences, and the resultant benefits for the individual and society are well-documented (Driver and others 1987). Recreational use of wilderness has continued to grow since the creation of the National Wilderness Preservation System (NWPS) in 1964. Recreational use of National Forest wilderness alone now exceeds 10 million recreation-visitor-days (RVDs) annually, and, proportionately, has grown faster than developed recreation use outside of wilderness (Reed 1990).

To date wilderness has often been treated as if recreation were the primary and sometimes only purpose of wilderness. However, the Wilderness Act describes with equal status a variety of wilderness purposes, specifically, recreational, scenic, scientific, education, conservation, and historical use. It does not acknowledge recreation as the most important purpose. In 1988, the Chairman of the House Subcommittee on National Parks and Public Lands (Vento 1988) made this point more emphatically, saying "*Congress* does not designate ***wilderness primarily for recreation.***" Such a diverse set of values and uses in wilderness is certainly what was described by early wilderness proponents (Nash 1982) and recent or contemporary advocates (Douglas 1965; Driver and others 1987; Leopold 1949; Nash 1980; Rolston 1986).

Although little is known about the true extent of nonrecreational uses, there is some evidence of just how common many of them are throughout the NWPS. One 1987 telephone survey of wilderness managers found some 75 percent of all wilderness areas contained known historic or prehistoric cultural sites; 50 percent protected one or more threatened or endangered species; 33 percent had ongoing scientific research projects, environmental education programs, or livestock grazing; and about 17 percent had known sites of spiritual importance, programs for human development, provided subsistence resources, or contained water storage facilities (Reed and others 1989). In word and deed, there is more to wilderness than recreation use.

WILDERNESS USE SETTINGS

In order to identify and understand potential conflicts between recreational and nonrecreational uses in wilderness, it is useful to first examine what each requires in terms of a wilderness setting.

Recreation

Recreation is defined as "refreshment of one's mind and body after labor through a diverting activity" (American Heritage Dictionary 1978). To this definition we should add that a satisfactory recreation experience realistically occurs only to the extent that its goal-object is attained in preferred physical, social, and managerial settings (Driver and Tocher 1970; Iso-Ahola 1980; Clark and Stankey 1979). Recreational activities in wilderness typically may include hiking, backpacking, horseback riding, packing, cross-country-skiing, snowshoeing, and canoeing. By definition in the Wilderness Act (Section 2c), recreational opportunities in wilderness are meant to be "primitive and unconfined," occurring in a setting "retaining its primeval character and influence," and "with the imprint of man's work substantially unnoticeable." The wilderness recreation experience should be one that allows visitors to get away from their increasingly

mechanized, fast-paced, and stressful society and interact more with nature. Thus, a recreational user of wilderness typically should not encounter a road, motorized vehicle or equipment, motorboat, landing of aircraft, or other forms of mechanical transport or installations.

Research over the past decade generally indicates that recreational visitors in wilderness do, in fact, commonly seek one or more of the following experiences: 1) a relationship with nature; 2) escaping pressure; 3) exercise, physical fitness, and challenge; 4) in-group relationships; and 5) personal development (Brown and Haas 1980; Roggenbuck 1980; Stankey and Schreyer 1987; Walsh and others 1982).

Scientific

The scientific value of wilderness is increasing rapidly in importance as concern over human impact on the environment spreads around the world. Three types of scientific studies typically occur in wilderness: 1) basic ecological research, 2) applied management research, and 3) social psychological research.

Basic ecological research aims at understanding natural processes and ecosystem functioning. This type of research uses wilderness as a control point to collect baseline information which can then be used as a comparison with more degraded ecosystems. Often this research is long-term and has little or no direct benefit to the wilderness itself. Applied management research usually focuses on assessment of human effects on wilderness and is designed to help manage wilderness areas better. This research is shorter-term in nature and directly benefits wilderness areas (Greene and Franklin 1989). Social-psychological research may use the wilderness setting to study the human relationship with nature. Research may also involve evaluating benefits that the wilderness setting produces for individuals through personal growth or to society as a whole (Manning 1989).

Central to enhancing the scientific use of wilderness is the existence of relatively undisturbed environments. While no wilderness is truly pristine, there should be little evidence of past or present human disturbance, such as by domestic cattle grazing, suppression of natural fire, hunting, fish stocking, or recreational use. Large areas where natural processes are allowed to operate freely and are unhindered by outside influences are essential for basic ecological research. Examples might be an entire watershed located within wilderness or a wildlife population whose long-term habitat needs can only be met within wilderness (Greene and Franklin 1989).

Educational

Like scientific use, the educational use of wilderness is also increasing in importance. The wilderness setting provides three types of educational experiences: 1) an outdoor classroom to learn about nature (the "University of Wilderness," as Thoreau called it); 2) a setting to learn outdoor skills; and 3) a place to learn about oneself through personal growth, and physical and mental development (Hendee 1987; Williams and others 1989).

Numerous organized groups currently use wilderness for educational purposes, including the National Outdoor Leadership School, Outward Bound, college environmental science classes, and groups that treat emotional disturbances (Levitt 1989). Agencies such as the Forest Service also have recognized the usefulness of the wilderness setting in educating their wilderness managers (Spray and Weingart 1989).

As a classroom to learn about nature, wilderness derives its value simply by providing an outdoor environment that enables students to learn through hands-on experiential education. However, wilderness provides its greatest value as an outdoor classroom by providing a relatively undisturbed, natural setting. Since many students come to learn about plants and animals, it is important that wilderness truly provide vast areas of native plant communities and natural abundances and distributions of wildlife and fish species. Rugged terrain and a setting that provides challenge and self-reliance are the primary requirements to learn outdoor skills. In terms of personal growth and the therapeutic value of wilderness, opportunities for solitude, reflection, and intra-group intimacy are probable setting requirements.

Cultural-Historical

The Wilderness Act cites historical use as one purpose of wilderness. Other legislation designating specific wilderness areas, such as the 1980 Central Idaho Wilderness Act, have actually mandated the protection of archaeological sites and the interpretation of sites for public benefit and knowledge. Cultural and historical resources provide a link with the roots of our heritage and can provide important information on the development and operation of societies. Specifically within wilderness areas, it may prove important to learn about past peoples who were able to adapt to environments we now consider too rugged, harsh, or remote to

develop (Neuman and Reinburg 1989). The primary setting requirement for the protection of the cultural resource value in wilderness is the lack of human disturbance that may be caused by trail development, recreation use, or vandalism, at least until inventories can be completed.

Preservation

One indirectly stated purpose, but widely recognized capability, of wilderness is the preservation of natural ecological diversity, and the protection of plants and animals at the genetic, species, and habitat levels (Davis 1989; Office of Technological Assessment 1987; Schonewald-Cox and Stohlgren 1989). The preservation of species within wilderness (especially that managed by the Fish and Wildlife Service) is subject to numerous other Federal and State laws, including most notably the 1973 Threatened and Endangered Species Act. The preservation value also includes the maintenance of carbon banks, watersheds, and airsheds (McCloskey 1989).

The preservation value arises from concerns that wild places are becoming increasingly scarce, to the point where wilderness areas and other natural areas serve as islands in a sea of fragmented, developed environments. The preservation value differs from the scientific value in that undisturbed environments are valued simply for preservation's sake rather than for an direct benefit to humans. The preservation value is embodied in Aldo Leopold's statement that "the first principle of intelligent tinkering is to save all the parts (Leopold 1949)."

The setting requirements to maintain preservation values are quite similar to maintaining scientific values. Large, undisturbed environments are required, where natural conditions prevail and natural processes are allowed to operate freely. Native plant communities and wildlife populations must be maintained at viable population levels in natural abundances and distributions. There should be little evidence of human impacts on vegetation, soil, air quality, and aquatic ecosystems.

Spiritual

While not directly mentioned as a purpose in the Wilderness Act, the potential of wilderness to provide individual or collective spiritual or religious experiences is well-known, if not loosely defined and described (Driver and others 1987; McDonald and others 1989; Rolston 1986). At the heart of spiritual value is a sense of connection or inter-relatedness with nature, God, and the world; that is, a sense of one's place in the "grand scheme of things." Sacred places are sites that hold special significance as places of power for individuals or groups.

As our civilized world becomes more hectic and stressful, it appears we increasingly need settings to regain our perspective and sense of place. Setting requirements may include lack of encounters with other people, lack of motorized noise, the opportunity to view wildlife on their terms, and an environment perceived as undisturbed and evolving--all the evidence of self-sustaining forces capable of operating independently of humans.

POTENTIAL **AREAS OF CONFLICT**

Conflicts Between Recreation and Nonrecreational Uses

Because wilderness has multiple purposes, there is always the potential for conflicts to develop among its different users by virtue of their different associated activities and practices. But, what conflict actually does occur?

Past research has focused little on comprehensive assessments of the potential or occurrence of recreational-nonrecreational use conflicts. For example, the recent Government Accounting Office (1989) survey of Forest Service wilderness management problems asked managers to describe conflicts which are essentially among recreation-oriented activities only. Earlier research suggests that up to now recreational-nomecreational use conflicts may have been relatively few in number. Washbume and Cole (1983) found few wilderness areas that considered research projects, historical or archeological sites, or snow and water measurement equipment to be "a problem" (although the cause or nature of "problem" was not defined). And, participants at the First National Wilderness Management Workshop in 1983 generally identified few, if any, specific recreational-nonrecreational use conflicts as important management issues (Frome 1985).[1] However, the 1987 telephone survey of wilderness managers found that one in six wilderness areas nationwide was experiencing *some* type of significant conflict between recreation and nonrecreational uses, and that the number of conflicts had been increasing in 11 percent of the areas over a three-year period (Reed and others 1989). Still, it is conceivable that either 1) more conflicts do occur but have not been well monitored or reported; or 2) the number of conflicts has been kept low because of unequal restrictions on nonrecreational uses thought to be detrimental to recreational use.'

Overall, it would appear that recreational and nonrecreational uses should and could be quite compatible from the standpoint of the Wilderness Act; and, judging from the above indications, for the most part they are. In fact, there is often no clear dichotomy between the various wilderness purposes. For example, a group may visit wilderness primarily for educational purposes to study alpine flora. However, on the hike in and during non-study times, the group may be using the wilderness setting for recreational purposes. Nevertheless, the potential for conflicts may prove' to be substantial. Certainly recreational use has the potential to interfere with nonrecreational uses and vice-versa.

Natural Diversity. Although there is little research to firmly establish the extent of impact or lack of impact by wilderness visitors on natural populations of plants and animals, some conflicts seem very likely. Wildlife may be traumatized by exposure to human activity, and natural species, sex, and age ratios may be altered by exposure to introduced species, as well as diseases from domestic pets and pack stock. Plant species, too, may face competition from exotic species introduced primarily through pack stock feed. In the San Jacinto Wilderness, recreation use, especially climbing use, has been implicated in the decline of locally or regionally rare plant species (Hamilton and Lassoie 1986).

Conversely, the only direct adverse effect on recreational users from visitors interested in preserving natural diversity of wilderness would be a continued exposure to indigenous, potentially harmful plants and animals (such as poisonous plants, bears, poisonous snakes, disease-carrying insects, etc.), or the denial of access to a certain area for species protection purposes. Plus, recreationists might be affected by the fact that several Congressional acts designating wilderness have authorized the construction of special facilities and motorized access for maintaining wildlife populations (Browning and others 1988).

Scientific Use. Science is a stated purpose of wilderness, but no clear direction in the Wilderness Act is set for scientific procedures. Thus, directions have largely been left up to individual agencies, which, in turn, generally have chosen to issue only broad policy statements.

Many scientific uses of wilderness necessitate gathering and/or transmitting of data using a team of researchers; utilizing mechanically or electrically-powered instruments, photographic equipment or radio-transmission devices which may derive their power from batteries, portable gasoline motors, or solar panels; and transporting materials along trails (or by air). Social science activities to study wilderness users often necessitate direct contact between wilderness managers-researchers and visitors at trailheads, campsites, or along trails.

Potential recreational-nonrecreational use conflicts include the adverse effects wilderness visitors may have on scientific equipment (theft or vandalism) and the disruption of experiments or study sites caused by their presence (trampling of vegetation, altering wildlife behavior, polluting water, etc.). Depending upon size, number, and power requirements, research equipment could be objectionable to recreational users for one or more reasons, including sight, noise, and odor of the equipment. Personal interviews may also result in a lower quality recreation visit if visitors do not wish to be bothered.

Cultural Resources. Historical values are one of the major purposes of wilderness. Like ecological preservation, the protection of culturally significant historic and prehistoric sites within wilderness is also subject to additional and sometimes conflicting direction found in other federal statutes, such as the 1966 National Historic Preservation Act and 1979 Archaeological Resources Protection Act (Neuman and Reinburg 1989).

Management options for preserving cultural resources in wilderness realistically range from benign neglect to deterioration, removal, survey, excavation, interpretation, structural protection from vandalism, looting, and weather. The latter options may require a group of people (managers, researchers, or volunteers) foreign materials, and tools, as well as transporting of materials along trails.

Potential recreational-nonrecreational use conflicts include the adverse effects that wilderness visitors may have on the integrity of cultural sites, such as through vandalism, looting, and soil erosion. Conversely, activities associated with protecting or researching cultural sites may negatively affect the opportunity for visitors to experience solitude and an environment free from contemporary man-made structures.

Education and Human Development. Education is another stated purpose of wilderness, according to the Wilderness Act. Along with various human development potentials, wilderness has been recognized for its abilities to stimulate physical and mental development and rehabilitation, including understanding oneself and the environment (Hendee 1987; Spray and Weingart 1989; Williams and others 1989).

Formal education programs often involve relatively large groups of people, by recreational visitor standards, along with their accompanying provisions, equipment, and noise. Potential conflicts relate to the nature of many educational groups, that is, their large size and conduct. The organization of educational or human development groups may be atypical of most recreational users. In addition, the very size of groups may concentrate impacts on wilderness wildlife, vegetation, soils, and water. In theory, because the wilderness environment is what is being sought by such groups, the only conflict with protecting nonrecreational values might be denial of access to these groups.

Spiritual **Use.** Use of wilderness for spiritual purposes may be achieved in so many ways, including the vicarious feelings of users who never set foot within wilderness, that it is one of the most difficult uses for which a range and nature of potential conflicts may be identified. Suffice it to say, lack of solitude and exposure to evidence of human use, either in terms of direct encounters with others or evidence of their past presence, is probably a major point of potential conflict. Certainly, recreational visitor behavior which is deemed disrespectful towards spiritually-significant locations or nature in all its aspects is apt to evoke conflict among those seeking a spiritual experience for personal or cultural aims.

There are instances where users of wilderness for spiritual purposes can adversely affect the quality of the wilderness environment. For example, temporary sweat lodges have been built and creeks dammed to create pools of water (US Department of Agriculture nd). Other activities may include creation of temporary drawings and symbols, such as prayer or "medicine" wheels.

Subsistence Use. Opportunities for subsistence use of wilderness resources generally are the result of either State Fish and Game regulations or previous Federal treaties with Native Americans. However, as with the 1980 Alaska National Interest Lands Conservation Act, subsistence rights can be guaranteed through legislation subsequent to the passage of the Wilderness Act. As many as 13 percent of wilderness areas may be used by Native Americans and other eligible groups for subsistence purposes (Reed and others 1989).

Although subsistence hunting, fishing, and gathering of nuts and berries are virtually identical in activity to recreational hunting, fishing, and gathering, conflicts could arise among subsistence users and recreational users who do not wish to be exposed to competition for the subsistence resource itself.

Conflicts Among Different Nonrecreational Uses

Of course, some of the conflicts previously described may also occur among the different nonrecreational uses for many of the same reasons. For example, activities of wilderness educators may conflict with the interests of preserving ecological diversity. Or, activities for cultural resource protection may conflict with other wildlife-oriented scientific activities. And, the activities associated with preservation of cultural resources and scientific use could be as in conflict with spiritual use as many recreational activities. These conflicts should not be considered any less important, even if they are less frequent or less probable. However, solutions to conflicts among different nonrecreational uses may be solved in the same manner as recreation-nonrecreation conflicts, and so are not described here in detail.

As the importance of nonrecreation wilderness values grows, there is increasing interest among managers to expand the LAC concept to address nonrecreation wilderness values.

POTENTIAL MANAGEMENT STRATEGIES

Conflicts between recreation and nonrecreation values are probably inevitable in the management of anything as physically, socially, and statutorily complex as wilderness. Nevertheless, it is a manager's responsibility to reduce conflicts in an effort to preserve an enduring resource of wilderness that meets the intent of the Wilderness Act, while at the same time providing opportunities for public use. In trying to resolve such conflicts, managers will often be confronted with issues that arise out of several concerns, including the assumed primacy of recreation, whether the activity is truly wilderness-dependent, conflicting direction from various Federal statutes, the cost of the activity, and availability of alternatives or substitutes.

We offer three potential strategies to increase the emphasis on nonrecreational wilderness purposes and reduce the conflicts between recreation and nonrecreation uses. These strategies involve 1) improving knowledge and awareness of nonrecreational values through training and education; 2) managing for recreation and nonrecreation values in an integrated, regional and national context; and 3) expanding the Limits of

Acceptable Change (LAC) planning framework to address nonrecreation wilderness values. Our discussion centers on the third strategy, but will first briefly describe the first two.

Strategy 1: Improve Knowledge and Awareness of Nonrecreational Values

Hendee and others (1978) noted that "wilderness management is essentially the management of human use and influence." However, in practice, wilderness management has been interpreted as the management of only some human uses--namely, recreation visitor use and its associated impacts. Indeed, within the federal agencies, wilderness management has typically been funded and staffed with recreation personnel. The management of wilderness to produce scientific, educational, cultural, spiritual, conservation, and therapeutic values, for example, must begin with a new mindset on the part of wilderness managers at all levels of responsibility. This new vision starts with an understanding, if not appreciation, of the entire range of wilderness purposes and the potential for conflicts.

One of the best ways to control adverse human influence is before it happens -- through education. User conflicts between recreational and nonrecreational interests could be reduced through education of both wilderness managers and visitors. This strategy is consistent with two of five major action items deemed essential to the preservation of the NWPS at the First National Wilderness Management Workshop in 1983 (Frome 1985).

The managing agencies are not alone. Universities must also develop more comprehensive curricula in wilderness management for forestry and natural resource graduates. And, Congress, too, can assist by explicitly stating nonrecreation values in wilderness legislation and by ceasing to allocate wilderness funding based on recreation use levels. In its oversight role, Congress can also monitor agency compliance with management for all wilderness values. Finally, citizens and conservation groups can become greater advocates of managing wilderness for scientific, cultural, educational, spiritual and conservation values by elevating public awareness and through consultation with local mangers and Congressional representatives.

Strategy 2: Manage Wilderness in an Integrated, Regional, and National Context

There is a similarity between managing wilderness as a resource that produces multiple values and managing other National Forests or Bureau of Land Management Public Lands for multiple-use. Problems inherent with the latter were ultimately responsible for the passage of the 1976 National Forest Management Act and the 1976 Federal Land Policy Management Act, respectively (Wilkinson and Anderson 1987). Both acts mandated a systematic approach to gathering data and evaluating the consequences of various management alternatives. Both acts included reference to wilderness management, although wilderness has been treated as a subunit of recreation by the agencies. Because wilderness has been so treated, many of its values, especially its nonrecreational values, receive no separate, comprehensive analysis during planning. This should not be acceptable for a resource which presently make up one-sixth of the National Forests System and potentially close to 10 percent of the much larger Public Lands system. Although not conceived of as specifically addressing nonrecreational uses per se, several noteworthy efforts have been made in developing management standards for wilderness resources, including air and water quality (Fox and others 1987; Fox and others 1989).

Wilderness does not exist in a vacuum. In reality, each wilderness has unique attributes which contribute to a larger regional and national mosaic of wilderness values within the NWPS. When establishing management goals and objectives, managers need to identify these attributes and insure that their actions do not compromise or limit another wilderness areas's ability to produce a particular value. For example, a decision to reject a scientific experiment on acid precipitation in one wilderness because of a potential conflict with recreation visitors could seriously compromise the value of similar research being conducted in three other wilderness areas, for which data from four different areas is needed. The decision to allow one historical or archeological site to deteriorate in one wilderness may be very consequential if that site were the last remaining of its type, rather than one of a great many located throughout the NWPS. Or, it could as easily be the case that a relatively rare recreational opportunity is discouraged in one wilderness so as to protect a relatively common wildlife species. Clearly, there must be some overall plan to minimize such occurrences.

A potential strategy to reduce conflicts in these situations would entail the preparation of a national wilderness resource assessment that takes into account the relative "supply" and "demand" for both recreation and nonrecreation wilderness resources. Implicit in such an undertaking would be a thorough inventory of wilderness resource capabilities, as well as a monitoring program to insure that the data base remains current. A formidable research plan would need to accompany this data base to help understand

the interactions between the various recreation and nonrecreation uses.

Managing for compatibility between recreation and nonrecreation wilderness values in an integrated, regional, and national context will require managers to think beyond administrative boundaries. Some managers must assume a fundamentally different role, to function as a coordinator bringing together scientists, educators, conservationists, spiritual leaders, therapists, archaeologists, and vicarious wilderness users, as well as recreational users, to develop compatible management goals, objectives, and actions. And, success must be measured by results--an evaluation of on-the-ground conditions--rather than by the amount or quality of coordination (Agee and Johnson 1988).

Strategy 3: Expansion of the Limits of Acceptable Change (LAC) System

The third strategy is not unrelated to the second. In 1988, Congress held oversight hearings on Forest Service wilderness management and requested the Government Accounting Office (GAO) to document the extent of resource damage in Forest Service wilderness areas. The GAO found that they could not accurately document the extent or seriousness of problems because wilderness areas did not have any baseline data inventory and monitoring system in place to track changes in conditions over time. Thus, the first of four recommendations made by the GAO was that wilderness managers must develop baseline inventory information and monitor changes in conditions (Government Accounting Office 1989). To accomplish this, the Forest Service is emphasizing the prompt completion of wilderness implementation schedules that must be developed using the LAC process (Woodrow 1989). The Bureau of Land Management and National Park Service have also begun to apply the LAC process or a comparable approach (Wuerthner 1990).

The LAC process represents a new way of thinking about wilderness management. In contrast to the carrying capacity approach where managers try to determine how many people could use the wilderness without causing damage, the LAC process focuses on what wilderness conditions are desired and how much change can be tolerated in different portions of the wilderness. The LAC process recognizes that the real concern is the effects of use, not how much use is occurring (Stankey and others 1985).

At the heart of the LAC concept (Figure 1) is identifying area concerns, issues, unique features, selecting measurable indicators, setting standards for acceptable limits of change in those conditions, inventorying conditions, and comparing conditions with standards. If standards are exceeded, managers need to identify causal factors and prescribe corrective management actions.

LAC was originally conceived as a process to manage recreation use in wilderness. One of the major premises of LAC is that recreation use is the primary source of change in conditions (Stankey and others 1985). However, as the importance of nonrecreation wilderness values grows, there is increasing interest among managers to expand the LAC concept to address nonrecreation wilderness values. Although such an expanded version of LAC has not been implemented in wilderness to date, we believe LAC offers considerable potential for increasing the compatibility between recreation and nonrecreation wilderness values. A valuable start to such expansion exists in the work on wilderness resource guidelines by Fox and others (Fox and others 1989; Fox and others 1987). It will make little sense to initiate a separate LAC process; rather, it should be integrated with recreation, with the wilderness setting as the common denominator. However, for purposes of this paper, we will only highlight the process for nonrecreational uses? For LAC to be successful, the public must be an integral part of the process. Typically, a task force is formed to work through the process. It is imperative that mangers begin by selecting task force members who can articulate and represent recreational and nonrecreational wilderness values. Because nonrecreational wilderness values have received little attention, managers will have to actively seek out scientists, educators, conservationists, archaeologists, spiritual leaders, therapists, and vicarious wilderness users to participate as task force members. Managers will also need to devote extra effort to develop educational programs that emphasize nonrecreation values and which can be used throughout the LAC process.

In the first step of the LAC process, area concerns and issues are identified. This step establishes the overall management direction. Managers could begin by listing recreation and nonrecreation values and assessing the ability of the wilderness area to produce each of these values with the help of task force members. This information might be obtained by asking what is special or unique about the wilderness area in terms of its scientific, cultural, educational, conservation, and spiritual qualities, as well as recreational. This question ultimately should be viewed in a regional and national context (thus the connection with the second strategy). For example, lodgepole pine forests may be common within a region. However, if lodgepole pine forests are intensively managed outside wilderness, then the existence of relatively undisturbed lodgepole pine

Figure 1. The Limits of Acceptable Change (LAC) planning system (Stankey and others 1985).

Step 1: Identify area concerns and issues
Step 2: Define and describe opportunity classes
Step 3: Select indicators of resource and social conditions
Step 4: Inventory resource and social conditions
Step 5: Specify standards for resource and social indicators
Step 6: Identify alternative opportunity class allocations
Step 7: Identify management actions for each alternative
Step 8: Evaluate and select an alternative
Step 9: Implement actions and monitor

forests within wilderness offer a unique scientific and educational value. Some of this information may be available by reviewing the legislation and hearing record that established the wilderness. This type of approach was clearly what Stankey and others (1985) intended in the original description of the LAC process.

In the second step, a hypothetical range of opportunity classes are defined and described. Opportunity classes describe the resource, social, and managerial setting visitors can expect to find in different portions of the wilderness, and all must comply with the intent of the Wilderness Act. Defining opportunity classes acknowledges that there is diversity within wilderness. This step more specifically describes desired future conditions and can be viewed as setting management goals. It is in the application of this step that nonrecreation values has received far too little emphasis.

Typically, very general terms such as "unmodified natural environment" and "minimally affected by the actions of visitors" are used to describe the resource setting. Whereas more attention is focused on describing the social setting in terms of number of encounters to be expected with other visitors and the managerial setting in terms of the specific types of visitor management actions to be expected (USDA 1987).

To increase the emphasis on nonrecreation values, managers must explicitly describe the resource setting in terms of all wilderness values. We would suggest developing a matrix that describes each opportunity class in terms if its recreational, scientific, educational, cultural, conservation, spiritual and managerial settings. For example, a description of the conservation setting for the most pristine opportunity class might read:

> "Area is characterized as being essentially undisturbed by human activities, both past and present. Natural processes such as fire and insects and diseases are allowed to operate freely in these areas. Biodiversity and species richness are high and the area contains habitat for numerous unique plant and animal species. The area exists as a contiguous block, such as an entire watershed, and is large enough so that viable populations can practically exist."

Indicator selection is the third step in the LAC process. Indicators are defined as specific elements of the wilderness setting that change in response to human activities (Merigliano 1987). Indicators must be measurable elements of the setting that can provide quantitative documentation of wilderness conditions. Indicators that measure the effects of human activities should be chosen over indicators that relate to management inputs. For example, the frequency of exotic plant occurrence is more meaningful as an indicator of vegetation community naturalness (scientific and conservation values) than the number of days managers spend on exotic plant control. Further, to increase reliability, managers would need to define what constitutes an exotic plant.

Selecting meaningful indicators, even one related to recreational impacts, is difficult.* Because nonrecreation wilderness values have received far less attention than campsite condition assessment and group encounters, it will be even more difficult to identify indicators than can be used to measure these values. Consulting knowledgeable scientists, conservationists, educators, and others will help

considerably, as will clearly written, specific opportunity class descriptions.

The fourth step is inventorying the wilderness resources and conditions. Within the Forest Service, in particular, little attention has been given to conducting comprehensive inventories of wilderness resources. This must change. Inventories should include the types of information identified in the second step, the well described opportunity classes. For example, not only should basic vegetative communities be mapped, but also characteristics which contribute to indices of biodiversity. This might necessitate collecting information on soil, topography, wildlife, fire, climate, and water--as well as sources of potential human-use threats. If such inventories were conducted according to consistent procedures, aggregate and commensurable national totals and locations of wilderness resources could be determined. Therefore, the significance of resources in one wilderness could take on added significance if few other wilderness areas possessed similar resources.

Like indicator selection, the fifth step, specifying standards, is very difficult due to people's differing perspectives and the uncertainty associated with determining what is a significant impact. Standards specify the amount of change we are willing to accept in each opportunity class, not the desired condition. Standards are a critical part of the LAC process because they are the specific objectives that are used to determine where and when management actions are needed and are used to evaluate the effectiveness of various management actions. Using the indicator "frequency of exotic plant occurrence" as an example, the standard for the most pristine opportunity class might be "no exotic plants occur in randomly selected plots," whereas the standard for the least pristine class might be "exotic plants occur in no more than 5% of randomly selected plots." It should be noted that standards should not be written to justify existing conditions that are unacceptable in wilderness, nor should standards permit the degradation of existing conditions.

If the first five steps of the LAC process are amended to adequately address the nonrecreational values of wilderness, the remaining four steps probably need no amendment. Once indicators are identified and standards for acceptable change are established, it is possible to determine specific locations within the wilderness where standards are not being achieved. With this knowledge, the task force can begin to identify specific management actions that can be implemented to achieve the standard. LAC plans written to date have typically identified actions that relate to managing recreation visitor use. By incorporating nonrecreation wilderness values throughout the LAC process defined thus far, there will likely be specific locations within the wilderness where the standards relating to scientific, educational, cultural, spiritual, or conservation values are not being met. Wilderness mangers will have to look beyond recreation visitor management strategies to effectively deal with identified problems. Again, the technical assistance of scientists, conservation leaders, educators, and others will be invaluable.

We have offered only a very general description of how the LAC process might be applied to adequately address the full range of wilderness values. It is up to individual area managers and involved citizens to develop the specifics. We sincerely believe the LAC process offers considerable promise to begin explicitly managing for both recreation and nonrecreation values in a way that will develop specific goals and objectives tied to desired on-the-ground conditions, establish a monitoring program to track changes, build an even broader public ownership in wilderness management, and more clearly identify the true costs associated with managing an enduring resource of wilderness.

It will not be easy. Managers will need to invest a lot of time and effort, from public involvement through management plan development and implementation. There will be frustrations with trying to deal with the political, social, and economic realities up-front, as well as with the lack of hard data and information to base decisions on. With any process as new as LAC and the lack of knowledge about managing for nonrecreation wilderness values, managers and citizens will need to use some creativity to develop solutions tailored to the particular wilderness. The difficulty should not be viewed as a barrier; for as a planning process, a LAC wilderness management plan should continuously be evaluated and refined as new knowledge becomes available.

SUMMARY

It seems clear that as our world becomes increasingly urban and "high-tech", with local and global environmental issues making headlines daily, the educational, scientific, preservation, cultural, and spiritual values of wilderness will rise to the forefront. Undoubtedly, developing the knowledge base and appropriate skills to manage for nonrecreational values is the greatest challenge wilderness managers will face in the coming decade.

The wilderness resource is too valuable and too threatened by a multitude of human activities to let ourselves become content and think we are truly managing an enduring resource of wilderness if just campsite conditions or trail encounters are

monitored. By doing so, we perpetuate the idea of wilderness as nothing more than a special type of recreation area, making it very difficult to build a case for the need for wilderness management in areas where recreation visitation is low.

New strategies must be developed and implemented to assure that nonrecreational values receive equal attention. This process must begin with increased knowledge and awareness of nonrecreational values at all levels of wilderness management. The process would be greatly facilitated by commitment to developing a national planning framework for the NWPS and the adoption of the LAC system modified to address recreational and nonrecreational values equally.

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ENDNOTES

1. Nevertheless, the on-going joint National Park Service and Forest Service wilderness aircraft overflight study indicates that the collective judgement of a conference does not necessarily match Congressional interests or perceptions of what is a problem.

2. It has been argued that those interested in the scientific and cultural uses of wilderness, for example, have been given less freedom of activity relative to recreational users (Greene and Franklin 1989; Neuman and Reinburg 1989).

3. Readers wishing to better understand the original, recreation-oriented context of LAC are referred to ***The Limits of Acceptable Change (LAC) System for Wilderness Planning*** by Stankey and others 1985.

NONCONFORMING WILDERNESS USES: CONFOUNDING ISSUES AND CHALLENGES

Frank R. Beum*

ABSTRACT

Nonconforming wilderness uses are those which do not correspond to wilderness as defined in the Wilderness Act, but which are allowed to occur by law as special provisions, The Wilderness Act allows for many such uses, and their management poses a significant challenge. A principle of harmonizing these uses with the ideal condition of wilderness by minimizing their impacts should guide management. Managers, researchers, and conservationists can work together to bring this about.

INTRODUCTION

The term "nonconforming wilderness use" can be ambiguous and confusing. Many managers, if asked to name these uses, would likely begin their list with grazing and mining. However, both of these uses are clearly permitted in and legally conform to the Wilderness Act of 1964 **(P.L.** 88-577). This begs the question — nonconforming to what? Defining the component parts of this term can shed some light on this question.

Defining nonconforming wilderness uses

The legal definition of wilderness is offered in Section 2. c. of the Wilderness Act, which states in part:

> ***"A wilderness, in contrast with those areas where man and his own works dominate the landscape, is hereby recognized as an area where the earth and its community of life are untrammelled by man, ... retaining its primeval character and influence, without permanent improvements or human habitation."***

The Random House Dictionary of the English Language (1967) defines conform as:

> ***to bring into agreement, correspondence, or harmony.***

Confining this paper to lands within the National Wilderness Preservation System, and using these two definitions as criteria, a nonconforming wilderness use could then be defined as one which, lenally or otherwise, is not in harmony or agreement with wilderness as defined in the Wilderness Act. However, as mentioned previously, grazing and mining are activities which are legally permitted in the Wilderness Act but which by their nature do not correspond with wilderness.

Clearly, the Wilderness Act defines the ideal condition of wilderness, and at the same time allows for uses which do not conform to this ideal condition.

Given this, the term "nonconforming wilderness use" as used in this paper refers to nonconformity to an ideal condition, rather than to law. Largely the result of political compromise, nonconforming wilderness uses can be defined as those uses which are not in harmony or agreement with the ideal condition of wilderness as defined in the Wilderness Act, but which are permitted to occur by law nonetheless as special or excepted provisions.

Types of Nonconforming Wilderness Uses

Section 4. d. of the Wilderness Act specifically allows as "special provisions", the use of aircraft and motorboats; mining; water prospecting; the establishment and maintenance of water reservoirs, power projects, transmission lines, or other facilities deemed in the public interest; livestock grazing where conducted prior to designation; and access to private land inholdings. In addition, the use of motorized or mechanized equipment is allowed under Section 4. c. of the Act, when "necessary to meet the minimum requirements for the administration of the area for the purpose of this Act" (P.L. 88-577).

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Wilderness legislation and congressional committee reports over the past 25 years have added to this list and, in some cases, reaffirmed Congressional intent to allow such uses to occur. Figure one lists 14 nonconforming wilderness uses, and undoubtedly is not all-inclusive. At the top of the list are grazing and mining. Also included are those permitted by subsequent legislation or administrative decisions, such as military uses and outfitter/guide caches.

NONCONFORMING WILDERNESS USES
Grazing
Mining
Gil and gas exploration
Use of motorized equipment
Use of mechanized equipment
Inholding access
Air transport
Military uses
Water impoundments
Administrative structures
Outfitter/guide permanent caches
Navigation or communication equipment
Weather monitoring equipment
Transmission or pipe lines

Figure 1. Partial list of nonconforming wilderness uses.

CONFOUNDING ISSUES AND CHALLENGES

Clearly, the Wilderness Act defines the ideal condition of wilderness, and at the same time allows for uses which do not conform to this ideal condition. Wilderness managers, confronted with this situation, can likely appreciate the definition of confound, which is listed in the Random House dictionary just after conform:

> ***to perplex or amaze; bewilder; confuse: 'The complicated directions confuse him.'***

The central, sometimes confounding, challenge inherent in managing nonconforming wilderness uses is one of preserving the primeval character of pristine natural areas while allowing uses which threaten this very quality.

Given the nature and extent of nonconforming wilderness uses, it would not be possible to outline all of the potential issues and challenges facing managers in this paper. The major issues surrounding the management of four nonconforming uses grazing, mining, use of motorized equipment, and access to inholdings will be discussed to illustrate some of these challenges.

Grazing

Figure two shows that in 1987, 35% of the wilderness areas in the National Wilderness Preservation System contained active grazing allotments (Reed and others 1988). According to a General Accounting Office (GAO) report, 702 cattle allotments and almost 2,000 sheep allotments were present in national forest wilderness areas in 1988.' By either estimate, it is apparent grazing is a fairly prevalent nonconforming wilderness use.

According to the Wilderness Act, grazing in wilderness is allowed to continue if established prior to designation "subject to such reasonable regulations as are deemed necessary by the Secretary of Agriculture" (P.L. 88-577). Since grazing was not an established use prior to designation for most national parks and wildlife refuge wilderness areas, this issue is largely confined to national forest and BLM wilderness areas.

By the late 1970s, during the Forest Service's RARE II wilderness allocation process, livestock operators were becoming increasingly concerned that the agency was interpreting the "reasonable restriction" provision in the Act too narrowly, and sought assurances that grazing would not be gradually phased out in designated wilderness. This led Congress to include in a committee report, House Report 96-617, for the 1980 Colorado Wilderness Act what has since become known as the "Colorado Grazing Guidelines" (U.S. House 1979). Possibly the closest the Wilderness Act has come to being amended in law to clarify the intentions of Congress, these guidelines specifically state that:

> ***there shall be no curtailments of grazing in wilderness areas because an area is, or has been designated as wilderness, nor should wilderness designations be used as an excuse by administrators to slowly 'phase out' grazing.***

These guidelines also allow for the maintenance and construction of grazing facilities, "including fences, line cabins, water wells and lines, and stock tanks", as well as "occasional use of motorized equipment." However, adjustments to livestock numbers can be made as a result of normal grazing planning processes, "given consideration to the legal mandates, range condition, and the protection of the range resource from deterioration" (U.S. House 1979).

These provisions were required to be "promptly, fully, and diligently implemented" by the Forest Service, and apply to all national forest wilderness

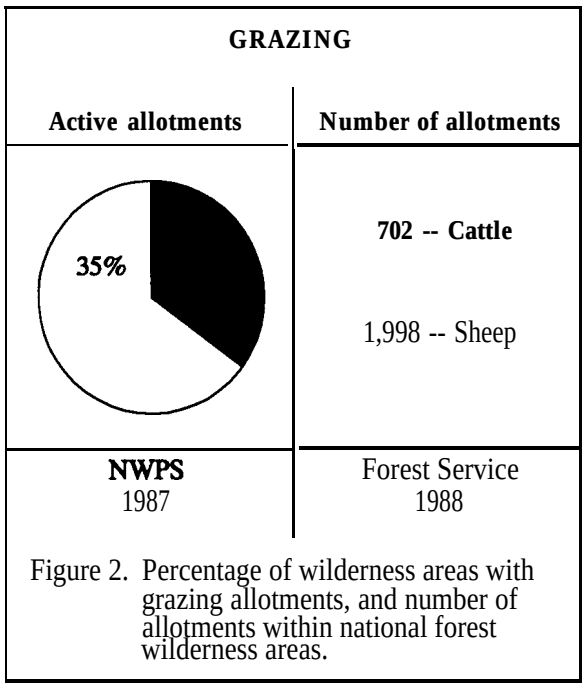

Figure 2. Percentage of wilderness areas with grazing allotments, and number of allotments within national forest wilderness areas.

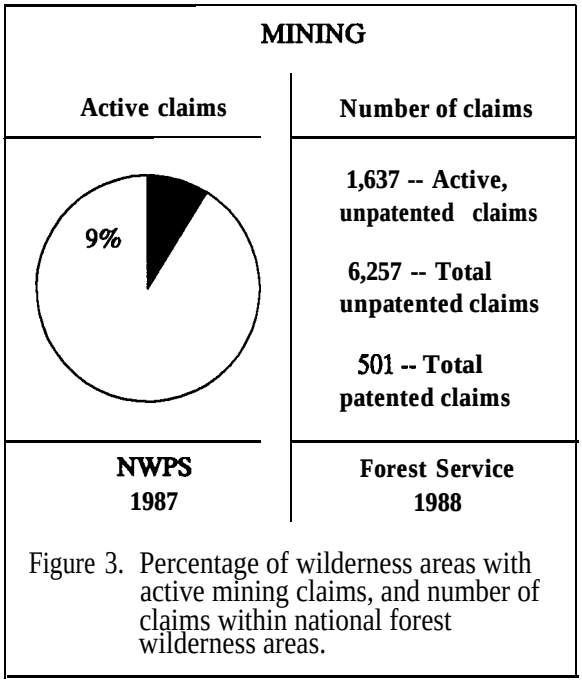

Figure 3. Percentage of wilderness areas with active mining claims, and number of claims within national forest wilderness areas.

areas. Significant among the several wilderness bills passed since 1980 referring to this committee report is the El Malpais Wilderness Act (P.L. 100-225), since this Act for the first time applied the provisions of House Report 96-617 to a BLM wilderness area (Browning and others 1988).

A major issue facing wilderness managers when addressing grazing is the conflict between livestock and native wildlife resulting from competition for forage and water (Marlow and Pognicnik 1985; Platts 1982; Ames 1977). Of particular concern are impacts to riparian areas which, although relatively small and linear, are disproportionately valuable for preserving biological diversity (Brown 1989; Higgins and Ohmart 1981).

Aside from the physical presence of livestock in wilderness, grazing permittees also construct and maintain facilities such as fencing and water containment structures, and motorized equipment is often used to do this work and to transport salt and feed. These activities have the potential to negatively impact wildlife, vegetation, soils, and water quality.

Mining

Figure three shows that 9% of wilderness areas contained active mining claims in 1987, while the GAO survey found that there were 1,637 active, unpatented mining claims in national forest wilderness areas.

Under the Wilderness Act, national forest wilderness areas were open to the staking of mining claims until January 1, 1984. New claims can no longer be staked, but valid claims established before 1984 can be worked at any time. Access to mine sites is to be permitted, and motorized equipment can be used "where essential." A minimum of $100 worth of annual maintenance work must be accomplished to maintain an active claim under the Mining Law of 1872. Again, this issue is largely confined to national forest and BLM wilderness since national parks and wildlife refuges were generally withdrawn from such activity when designated.

Mining is permitted in wilderness primarily because this compromise was necessary to secure final passage of the Wilderness Act. Clearly, mining does not correspond to the ideal condition of wilderness, but Congress recognized that some areas may contain mineral resources which were, or could become, valuable or necessary to the public good. During the 20 years available for the establishment of mineral rights, little exploration occurred. Since few economic incentives exist for mining in wilderness, Congress directed the Secretary of Interior to conduct inventories of minerals within wilderness areas (Society of American Foresters 1989).

Mining in wilderness is a complex legal issue, as noted by Browning, Hendee, and Roggenbuck (1988).[2] Some of the major issues confronting wilderness managers relating to mining are mineral inventories, validation of mining claims, approval of mining operation plans, regulation of motorized use, and reclamation of abandoned claims.

To conduct a validity check, the agencies must determine if a mineral deposit can be "extracted,

removed, and marketed at profit" (Wilkinson and Anderson 1987). If a claim is validated, the agencies still retain considerable control over mining operations, since title to the surface resources is generally retained by the federal government.

Before a valid claim can be worked, the managing agency must conduct an environmental analysis to determine if a full environmental impact statement is needed. If the mining operation is approved, the Forest Service requires that an operating plan must then be developed which outlines the types of surface disturbing activities, including motorized access, which will likely take place during the operation of the mine. The plan also specifies that reclamation must minimize evidence of man's activities, and may require the posting of a performance bond (Wilkinson and Anderson 1987).

New issues may be on the horizon for wilderness mining if the Mining Law of 1872 is reformed, as is currently being advocated by several conservation organizations and members of Congress. One potential reform long sought by conservationists would be the establishment of an annual "mining claim holding fee" to replace the current requirement on claimants to perform $100 worth of annual minesite maintenance work.

Motorized Equipment and Inholding Access

As shown in figure four,. authorized, non-emergency motorized access was permitted in 27% of wilderness areas in 1987. According to the GAO study, 46% of national forest areas with authorized use of motorized equipment experienced this use from 1 to 10 times a year, while this use occurred over 100 times per year in 5% of the areas surveyed.

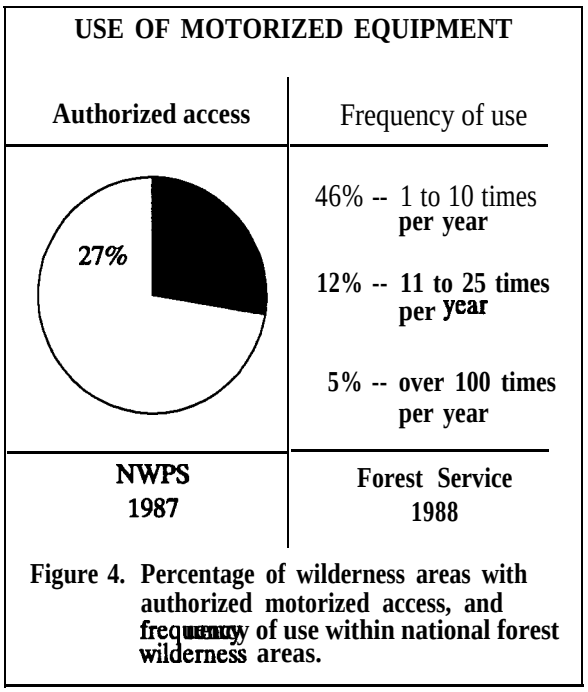

Figure 4. Percentage of wilderness areas with authorized motorized access, and frequency of use within national forest wilderness areas.

Since access to private land inholdings is closely tied to the use of motorized equipment, this use will be discussed here as well. Figure five shows that in 1987, 38% of wilderness areas contained private land inholdings, and the GAO study found that 24% of Forest Service managers found this to greatly increase management difficulty.

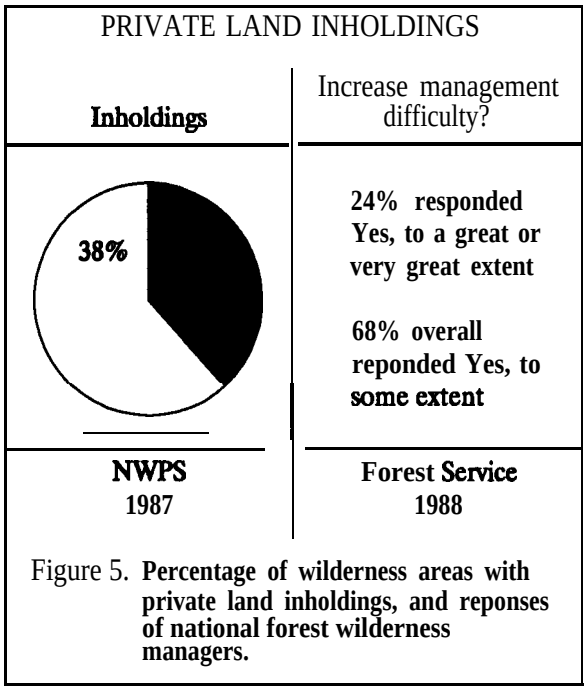

Figure 5. **Percentage of wilderness areas with private land inholdings, and reponses of national forest wilderness managers.**

Use of motorized equipment is clearly inconsistent with the ideal condition of wilderness. However, it is permitted for access to private inholdings, administrative uses, research, and maintenance of grazing allotments and mining claims, among other purposes under the Wilderness Act (P.L. 88-577). It may take the form of a wheeled vehicle, aircraft, snowmobile, or chainsaw. The use of motorized equipment in wilderness has the potential to negatively impact recreationists seeking solitude, wildlife, vegetation and soil.

MANAGING NONCONFORMING USES

Given the variety of issues involved with managing nonconforming wilderness uses, a discussion of general principles may prove most beneficial. The Society of American Foresters' recently released report, entitled *Wilderness Management*, addresses this issue. The report lists sixteen principles of wilderness management, the last of which states that managing agencies should "manage special

provisions provided for by wilderness legislation with minimum impact on the wilderness resource" (Society of American Foresters 1989).

The definitions presented in the introductory section of this paper can also offer a useful guiding principle for this task management of nonconforming wilderness uses should seek, to the greatest extent possible, to harmonize these uses with the ideal condition of wilderness as defined in the Wilderness Act. In fact, the Forest Service's Wilderness Management Handbook states that "the establishment of a harmonious relationship between livestock grazing activities and the wilderness resource" is to be attained when managing grazing in wilderness (USDA Forest Service 1986).

Several management tools are available to reduce the negative impacts of nonconforming wilderness uses and bring them into a more harmonious relationship with wilderness. The principles of Limits of Acceptable Change (LAC) can be applied to the management of many nonconforming uses, including selecting indicators of resource conditions, inventorying those conditions, setting standards for condition indicators, implementing management actions and monitoring conditions.

The central, sometimes confounding, challenge inherent in managing nonconforming wilderness uses is one of preserving the primeval character of pristine natural areas while allowing uses which threaten these very qualities.

The information obtained in these processes is essential to ensure that nonconforming uses have the minimum impact on the wilderness resource. For example, if the condition of the range resource is found to be poor through monitoring, livestock numbers can be reduced to lower this impact. Without this vital information, little can be done to manage these uses.

To adequately interpret this type of information, wilderness managers must both work closely with resource specialists in related fields and acquire new skills or training which many do not now have. To deal effectively with and earn the respect of stockmen, miners, and others involved in nonconforming uses, key elements of range science, mining, and other uses must be understood to minimize unnecessary impacts.

Administrative use of motorized and mechanized equipment should be reduced or eliminated where possible, so that an example is set for other users. A rigorous test of necessity and reasonableness should be met before authorizing motorized use in wilderness. Managers can work to instill a wilderness ethic in those who participate in nonconforming uses to reduce impacts, and information can be provided to other wilderness users explaining why these nonconforming uses occur in wilderness.

Given the marginal economics of wilderness mining, checking the validity of mining claims can likely reduce the potential negative impact of this activity. Abandoned mine site reclamation can further reduce these impacts.

The research community can help by providing information which managers can use to reduce the impact of nonconforming uses on wilderness. For example, research is needed on the effects of various grazing systems used in wilderness, including year-long and three- and four-pasture rest rotation systems, so that grazing systems are developed to protect wilderness values. Research can also improve techniques for wilderness minesite reclamation.

Conservation organizations can assist in ensuring that impacts from nonconforming wilderness uses are minimized in several ways. Educating and motivating citizens to become more actively involved in assisting the federal agencies manage these uses can help. Increased funding for wilderness management programs will be needed to better manage nonconforming uses, and conservation organizations can testify before Congress for higher budget and personnel levels. Partnerships can also be formed between conservation organizations and the federal agencies to work on these issues.

CONCLUSIONS

Obviously there are a number of wilderness uses which can be termed nonconforming. Managing these uses while preserving the wilderness character of these lands poses significant challenges. Conflicts between nonconforming uses and non-recreational purposes of wilderness, including scientific, educational, and conservation uses, can be great.

While management of nonconforming uses in wilderness can often be confounding, the challenge can be met. The overriding principle to follow when managing these uses is to harmonize nonconforming wilderness uses with the ideal condition of wilderness by minimizing their negative impacts.

Managers can meet this challenge by applying the principles of LAC to nonconforming uses, reducing or eliminating administrative nonconforming activities, and educating those who participate in these activities in wilderness values. Research can improve management of some nonconforming uses such as grazing and mining. Conservation organizations can become more involved in the issues surrounding nonconforming wilderness uses in a variety of ways.

By working together, managers, researchers and conservationists can reduce the impacts from nonconforming uses so that the primeval characteristics of wilderness can endure into the 21st century.

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ENDNOTES

1. The numbers attributed to "Forest Service--1988" in figures two and three represent the author's interpolation of results originally reported as means in the 1989 General Accounting Office report, Wilderness Preservation: Problems in Some National Forests Should be Addressed. The 587 USDA Forest Service Ranger Districts responsible for managing the agencies 354 wilderness areas were surveyed for this study, with a reported response rate of 92% on the issue of grazing, and 45% for mining (GAO 1989). The numbers shown in these two figures reflect an interpolation based on these response rates.

2. For a more detailed account of the laws and regulations surrounding wilderness mining, see Coggins and Wilkinson 1987; Wilkinson and Anderson 1987; or Loop 1986.

WILDERNESS AS HEAVEN ON EARTH

Barbara McDonald*

ABSTRACT

A growing awareness of environmental degradation has the hidden potential to promote the view of nature and wilderness as intrinsically valuable. Early American pioneers viewed nature as a wilderness to be tamed and set the stage for current American utilitarian views toward nature. Modern emphasis on science over mysticism as the proper way of knowing and living, along with a religious justification that began with the manifest destiny, have permitted a parallel growth in religious attitudes that support the dominance, control, use, and degradation of nature. The scientific theory of evolution, as a replacement for pre-scientific creation mythology, may as well provide a model for interpreting science in a new way so as to preserve mysticism as well. Protecting wilderness, and thus recognizing the wisdom and mystery of the creator, puts the spirituality of nature above the desires of humans, and recognizes that nature possesses a spirituality of its own.

INTRODUCTION

Of the values that may be attributed to wilderness areas and issues, one of the most elusive yet alluring is spiritual value. Wilderness may be inspiring, renewing, and recreational, a potential heaven on earth for individuals seeking reprieve from a complex, highly industrialized, and technological society. Now that technology has freed most Americans from a daily concern with securing basic physical necessities and with the growing awareness of environmental degradation caused by man's abuse of this technology, a view of nature as intrinsically valuable may emerge after being almost lost in modem industrial Western society. In addition, environmental problems may promote the idea of humans as stewards of nature, rather than nature being viewed as a resource to be dominated and used (Carpenter 1989). Still, a stewardship view falls short of recognizing the intrinsic value of nature. It implies human actions on behalf of nature rather than recognizing the right of nature to act on its own behalf, or to exist for its own sake. The intrinsic value of wilderness may become more salient, however, as fewer land areas remain untouched by the impact of man. (Author's Note: The specificity of the male gender is intentional to emphasize the impact of patriarchal dominance in Western philosophy, attitudes, and actions.)

Of the values that may be attributed to wilderness areas and issues, one of the most elusive yet alluring is spiritual value.

AN EVOLVING SPIRITUALITY OF WILDERNESS

A view of wilderness as divine has evolved slowly among present-day Americans. Pioneers viewed American wilderness as a hardship to overcome, tame, and control. They justified this approach under a vision of manifest destiny: the land was not to be revered and protected as God's creation, but was given by God for white man's profit and benefit. Few individuals during the western settlement era in America's history acknowledged the intrinsic value of the wild American landscape. Early advocates of nature, however, including Muir, Whitman, and Thoreau, planted the philosophical and intellectual seeds of environmental awareness, including a reverence for the spiritual dimensions of nature unspoiled by man.

These early environmentalists reflected the reverence for nature that was evident in Native American myths, legends, and lifestyles. Regardless of the specific religious manifestations, Native Americans in general believed that nature was sacred, and that even inanimate objects such as rocks are manifestations of the "Great Spirit" (Brown 1982). Native American spirituality and the work of the early environmentalists laid the philosophical

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framework for modern Americans to reconsider the spiritual and intrinsic value of nature.

Today, some Americans are indeed revisiting the idea of nature as divine creation, as a manifestation of the divine creator. This view appears in books such as The Coming of the Cosmic Christ (Fox 1988). An evolving concern for wilderness preservation (i.e., the preservation of nature apart from man's manipulation) is reflected in political actions such as the Wilderness Act of 1964, and in a recent USA Today poll indicating that 51% of the American public is concerned with wilderness issues (Kalette 1990).

SPIRITUALITY IN THE WILDERNESS ACT

Even though the spiritual value of wilderness was recognized by some individuals prior to other now well recognized values (recreational, scientific, cultural), spiritual value today remains elusive and has been avoided as a legally legitimating value of wilderness. Spiritual value is conspicuously unacknowledged in the language of the Wilderness Act, yet this value provided the philosophical foundation of wilderness preservation that brought about the legal protection of these areas (Vest 1987).

The reasons for the elimination of spiritual values from legal, scientific, and intellectual discussion are not difficult to imagine. Spiritual value defies an easy and widely acceptable definition. Discussions of spiritual value can easily become mired in religious dogma. The historic and legal separation of church and state provided by the U.S. Constitution further inhibits the legal recognition of spiritual values as a legitimate purpose for public lands (McDonald 1988).

DEFINITIONS OF SPIRITUALITY AND THE SPIRITUAL DIMENSION

The various descriptions of spirituality and its related concepts can hopefully be merged into a generally accepted definition, predicated on the assumption that specific religious creeds will not direct that definition. Matthew Fox (1979) called spirituality "a way of living that spiritual people engage in, whereas religion is what empires need to sustain themselves." Others have defined spiritual experience as an encounter or a relationship between an individual and God (Bratton 1989), and as a feeling of unity with the natural world (McDonald 1988). While the above authors couched their definitions in human-centered language, human recognition of spirituality is not necessary for spirituality to exist. William James (1936) called the spiritual dimension an "unseen world...the stream of ideal tendency." For the purposes of this paper, "spirit" and its related concepts are considered part of a universal energy, James' "ideal tendency," which exists in nature and in all beings. Spirituality is the action of and communion with this energy.

Recently, Thomas Berry (1988) divided spirituality into two categories. These categories are useful to an understanding of the human aspects of spirituality. Private spirituality was defined as "the cultivated spirituality of marginal groups or individuals engaged in extensive prayer and meditation apart from the dynamics of the larger human community." Public spirituality, on the other hand, Berry described as "the functional values and their means of attainment in an identifiable human community." Thus, human-based spirituality is the process of public or private communion of an individual or individuals with the universal creative energy existing in all life.

Distinctions between interpretations of ideas of god, divine creation, spiritual, and intrinsic value, for example, are difficult to draw but are indeed necessary. Intrinsic value may be viewed as value apart from any external purpose, that is, a thing having value for its own sake. Spiritual value may be excluded from the category of intrinsic value, if the spiritual domain is viewed as the domain of a creator who is external to creation. However, if the creator and creation are viewed as mutually generating, that is, there can be no creator without creation and vice versa, intrinsic value may indeed be spiritual as well. Spiritual qualities would arise from the creator or creative energy within the creation.

But what or who is this creator or creative energy? Names and descriptions necessarily limit the scope of a creator/creation model, regardless of whether this model is called god, creator, divine energy, or anything else. In this paper, the term creator is used to represent the idea of an interdependent, mutually generating, creator/creation energy. Spirituality, therefore, is viewed as one of the intrinsic values of nature, and is not dependent upon human-assigned values as it might typically be considered.

THE PROBLEMS WITH SPIRITUAL DEFINITIONS

Berry's private spirituality ties in with discussions of the psychological paradigm of wilderness, such as individual emotive aspects (including individual benefits perceived in solitude), mental and emotional therapeutic benefits of wilderness; and qualities of awe, wonder, peace, harmony, and self-affirmation, among others. Public spirituality captures the social and geographic paradigm, including cultural spirituality, and resulting political priorities and decisions. Broad social concurrence about spiritual

beliefs influences cultural norms and political decisions, as is demonstrated in current deliberations on the abortion issue. Discussions and decisions about sacred places are included in this category of public spirituality, as are discussions of various religions and of our cultural heritage.

The various paradigms for discussion only partially capture the concept of spirituality in wilderness. These paradigms are problematic partly because they represent an anthropocentric interpretation of the meaning of spirituality and of wilderness. A further problem with current discussions of spirituality in wilderness is the suggested emphasis on the scientific method over spiritual and intuitive ways of knowing and understanding in academic circles and in the industrial Western world. Reflecting this attitude of scientism, Western science has attempted to explain much of the mystery of nature and therefore of spirituality. In the Western world, science has replaced spirituality in all but its most emotive aspects. Even here, physical explanations of spiritual emotive experiences are beginning to emerge in the neuroscience literature (d' Aquili 1985).

These psychological, social, and physical science discussions of spirituality in nature and wilderness will ultimately fail to satisfy because they fail to address spirituality holistically and they ignore its mystical aspects. These discussions do not integrate the tangible and intangible or mystical dimensions of spirituality in wilderness, but regard the intangible as either non-scientific or as a scientific unknown. It is not science, per se, that inhibits the integration of spiritual value into an understanding of nature, but the attitude that is assumed when science is undertaken, interpreted, discussed, and applied. Thus, much of the mystery and reverence previously felt about and for nature has been lost through a growing reverence for and reliance on science and scientism.

The Native American philosophy of respect and reverence for the Great Spirit present in nature was first displaced by the pioneer belief in manifest destiny. This attitude of assuming control of nature has become even more central to Western thought. With it has come not only the continued domination of nature, but a supporting religious justification for a spirituality of science, or a way of living that is rooted in scientism rather than mysticism and respect for the mystery of the creator.

WESTERN SCIENCE AND WESTERN RELIGION AS SOURCES OF SPIRITUAL PARADIGMS

Human cultures typically have been formed around a shared explanation of where and how life began, who created and creates life, and the meaning and purpose of death. In early, pre-scientific societies, the spiritual and mystical dimension of life was all encompassing, since these primary questions were answered through mystical and religious explanations and celebrated in spiritual ritual and mystical experience. Today, as a replacement for pre-scientific spiritual and mystical explanations of creation, the human species reveres scientism, a substitute for mystical spirituality that not only explains creation, but takes creation out of the hands of the creator and willingly puts it into the hands of men. In as much as men reflect creator and creation, the destruction wrought by Western scientism may also be viewed simply as a dark side of the creator. By recognizing the dark aspect of creation, the scientism of Western society may be defended. But, in so doing, Western society is risking the abandonment of spirituality as mystery and reverence for the unknown, and replacing it with a spirituality based on complete knowledge of nature. Western religious beliefs have evolved in such a way as to confirm the rightness of knowledge, dominion, and control of the natural world.

Worship of scientism and its counterpart in the form of Western religion have generally been effective in isolating humans further from nature, and in demystifying most of life itself. Scientism and technicism, in tandem with Western religious views based on ideas such as manifest destiny, have lulled most of the Western world into a consumptive lifestyle that is manipulating, dominating, and depleting the natural world. The goal of scientism is to understand, manipulate, and control the environment, based on scientific knowledge, and this goal is supported by Western religion, which suggests that humans transcend the evils and temptations of the natural world, and hope instead for a home in heaven, which is above (i.e. apart from) the physical and natural world (Berry 1988). Wendell Berry (1972) observed that the "excerpting of the Creator from the creation" is perhaps one of the "greatest disaster(s) of human history." The separation of creator from creation is encouraged by both the science and religion of modem Western man.

Western technological and industrial society has justified a disdain for and a determined manipulation of nature, through the development and acceptance of these parallel religious beliefs: 1) God is transcendent, and not of the physical world, 2) Humans, and no other animals, have souls and eternal life, and 3) It is God's will that nature should be used for man's benefit. Much of Western society believes, therefore, in a God in heaven but not on earth, that eternal life may be gained by humans only by transcending (or manipulating and controlling) nature, and that human fulfillment will

be the result of the control and transcendence of nature.

Western science and Western religion, though separate endeavors, operate as parallel systems that justify current human attitudes toward and destruction of nature (Berry 1988). In the religious realm, humans worship God as divine creator. In the activity of science and based on an attitude of scientism, however, they become the creator. By perpetuating this dilemma, humans will never integrate scientism and mysticism, and will continue the scientific quest to unlock the mysteries of life and death, further isolating mysticism from human experience. How can modem man worship the creator as sacred, omnipotent, and mysterious, and be the creator too? Scientism has become deeply embedded in American society as the foundation of a profitable industry and technology, therefore the necessity for more scientific knowledge is accepted without question. Continued work in genetic and trans-genie engineering of plant and animal species is unraveling the mysteries of creation. The divine creator's domain will surely be changed if not diminished, by this science. Scientism defines and reduces the role of mystical spirituality in Western society. The result is the continued abandonment of mystical spirituality for a scientific replacement.

The emphasis on scientism over mysticism must be challenged if man is to preserve the whole domain of divine creation. The science industry, deeply ingrained in American society, will not bow easily to these concerns.

On the surface, the legal protection of wilderness areas appears to be one of the few exceptions to Western man's dominion and control of nature (i.e., scientism). Unfortunately, this is not the case. Wilderness is preserved for distinctly human values, including scientific, cultural, and various individual and social benefits. Only the preservation of biodiversity as a purpose recognizes the possibility of an intrinsic (or extra-human) value of wilderness. Continued legal and social support for nonconforming uses, as well as acceptance of continued human encroachment from outside wilderness borders (such as from acid rain or overflights) belies the shallowness of social commitment to truly preserving some public lands from human impact, and exposes the determination of American society not to relinquish control and dominion of nature, even in so-called wilderness areas, to a non-human creator.

REAL WILDERNESS: A RETURN TO MYSTICISM AND SPIRITUALITY

To preserve the mystical and spiritual value of wilderness, a new view of science and spirituality is needed. The prehistoric and pre-scientific stories of creation, for so long shrouded in myth and mysticism, have been transformed by scientific knowledge into the theory of evolution (Berry 1988). The widespread social acceptance of evolution theory has set the story of human creation in a new light. Evolution theory, which on the one hand has removed a part of the mystery from creation mythology, has on the other hand the potential to interpret scientific inquiry in a new light and in so doing, to propel the mystical and spiritual value of wilderness to a place of prominence. The protection of wilderness will preserve not only the natural creative process of evolution, but will also preserve the direct opportunity to participate in, respect and revere that process. In so doing, wilderness protection will also preserve the divine creator, in its non-human manifestation.

The major spiritual value of wilderness, therefore, is located in the creative process of evolution.

Evolution theory has the potential to complement the mystical spirituality of wilderness because it relates the human species to all other species, thus providing for the communal aspects of spirituality, and recognizes man's incomplete knowledge, thus preserving divine creation untouched by human intervention. Evolution, the scientific story of creation, reminds humans that their relationship to the natural world is not just scientific, but mystical as well. If evolution is accepted as a'non-human but divine way of creating life (as a replacement for the earlier creation myths), then it is imperative that non-human divine creation be allowed to continue in wilderness areas. From a scientific viewpoint, the leaving of species and ecosystems to evolve undisturbed by human modification (as a control group for scientific experimentation, if for nothing else) needs little further justification. The role of science in the discovery of evolution makes evolution theory a palatable creation story in a society worshipping scientific knowledge. It could represent as well the understanding of science without the attitude of scientism, and therefore integrate mystical spirituality and science without the degradation that may be associated with scientism and technicism.

The argument that man as part of divine creation is fulfilling his manifest destiny through the application of science and technology is contradicted by the historic tendency of evolution. The new trend toward uniformity, caused in part by the trans-genie and genetic engineering of plant and animal species,

mono-agriculture, development of the built environment, as well as the blending of cultures worldwide, appears opposed to the evolutionary process, which has created increased biodiversity and natural adaptation across the aeons. Natural biodiversity is threatened by the homogenization of the planet.

Man considers himself knowledgeable, but experience has often indicated the folly of his knowledge. For example, the creation of polystyrene was viewed as an improvement in insulation and packaging, yet society has begun to recognize the massive waste disposal problem created by this improvement. We should not assume, therefore, that scientific knowledge and technology are superior to natural evolution. There are no assurances of this, except those of human arrogance.

According to evolution theory, surviving individuals and species are those best able to adapt to a changing environment. Perhaps the preservation of wilderness, despite the momentum against it, is one such adaptation. If unprotected land is given completely over to technological man, humans may one day find it necessary to rely on naturally-evolved ecosystems, which will have been preserved only in wilderness.

Its possible role in our physical and ecological salvation does not exhaust the value of wilderness. If man continues in his quest to play the creator in every vestige of life, then divine creation untouched by man will only truly exist in areas protected from man as wilderness. Non-human creation will be found only in designated wild places, where the creative work of nature is least unfettered by human scientism. Already, this phenomenon is apparent: humans seek reprieve from industrial and technological society by escaping to nature for refreshment, relaxation, and recreation.

The major spiritual value of wilderness, therefore, is located in the creative process of evolution. The values of wilderness spirituality go beyond the private spirituality described by Berry, and even beyond the human-based existence value of wilderness spirituality. Wilderness spirituality must also become a public spirituality, a part of the conscience and integrity of Western human society. This implies a modification of the attitude of scientism, at least in wilderness policy and management. Wilderness spirituality has the potential to preserve the original sense of the spirit: nature and wilderness are not human products, but are divine creative processes; and non-humans and the earth itself share that spirit with humans.

If Western society is to protect a variety of opportunities for mystical spiritual experiences, bold policy and management actions are necessary. Wilderness spirituality suggests a surrender of human dominion, desire, and control of nature. Nonconforming uses, such as mining and grazing in wilderness areas, must be eliminated. Some wilderness areas should remain untouched to the degree possible by any human activity. In a spiritual sense, the activity of the creator must be placed above the perceived needs and desires of man. In wilderness policy and management, indeed in the Wilderness Act itself, it must be recognized that wilderness has its own spirituality, and therefore must be protected from the domination and control of man.

MANAGING WILDERNESS AS HEAVEN ON EARTH

What, then, are the opportunities and challenges to managing wilderness resources for spiritual values? Providing for private spirituality, a manager might want to consider the work of the physical and neuroscientists, the theory of chaos, and landscape design principles. These scientific findings provide the solid scientific management guidelines that many seek. If interpreted with a balanced background of spirituality, mysticism, and a respect for science, these scientific findings may truly enhance re-creational experiences while protecting the non-recreational values of wilderness.

For example, neuroscience literature has begun to discover the importance of ritual and rhythm in creating a sense of unity within the individual. Neuroscientists hypothesize that rhythmic activity causes the simultaneous firing of the sympathetic and parasympathetic nervous systems (d' Aquili 1985). Wilderness planners and managers may use this information to enhance human opportunities for experiences promoting unity, but can also respect the experiences of wild nature as well. For example, rhythms occur continually in nature: in the days and seasons, in the rushing of water, in the life spans of living things. Trails may be routed near rushing water, and use may be encouraged in all seasons. Some areas may be prohibited to humans, so as to preserve wilderness sanctuaries that enable natural rhythms to continue unbroken. Rhythmic activities, such as canoeing and hiking, could be recognized as providing opportunities for experiencing unity, and a mystical spirituality, not just as adventure, leisure, or recreation.

Another scientific explanation for spiritual experiences in wilderness comes form the theory of chaos (Gleick 1987). The existence of near endlessly repeating patterns at different scales is hypothesized to be one of the aesthetic attractors in art, landscape, and architecture. The science of fractal geometry has proven that nature's patterns are repeating, from the micro to the macro cosmos

(Gleick 1987). Using these findings as a guide, wilderness managers could be sensitive to opportunities for users to appreciate the micro and the macro: from the budding flower and the tiniest pebbles to the expanse of a sunset or a rocky gorge. In considering nature, management should respect not only the micro environment, but should recognize the macro as well. Some larger species may be then protected from direct human impact within a larger habitat, and larger ecosystems would be more routinely protected from recreational and other human impacts.

Other scientific explanations for sacred areas have included variations in the earth's magnetic field, high altitude, and the presence of anti-depressants such as lithium in artesian springs. Rather than using these speculations of science to de-mystify the natural world, wilderness managers can improve management practices for users and for the wilderness resource itself. Rather than interpret all new knowledge with an attitude of scientism, a deeper respect for the comprehensive mystery of life can be enhanced. Specific guidelines for recreational and non-recreational use, based on these scientific findings, may include designing trails for a diversity of visual and auditory scaling, simultaneously or singularly; designing trails that would make the power of nature available to experience, by passing near waterfalls or rocky cliffs: allowing visitors to experience the world of wildlife or to identify clues as to the presence of wildlife; minimizing human impact near these identified sites; making available some of the culturally significant sacred sites or sites of nature's power; maximizing opportunities and sites for meditation and for hiking and other rhythmic activities.

Addressing public spirituality, however, will require a public demand for policy and management decisions to leave some wilderness areas untouched and unavailable to human impact, where the work of evolution and divine creation can continue unrestrained. In wilderness policy, better balance between science and mystical spirituality is needed. This balance, when applied in wilderness settings, demands action without regard for current human desires and perceived needs. It puts the spiritual work of the divine creator above the fancy of humans, and recognizes the possible destructiveness of human actions. Such a balance in emphasis would recognize an incomplete knowledge of both science and spiritual matters, and recognize also that apart from the personal or cultural benefits wilderness gives to us, wilderness possesses a spirituality of its own.

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PART IV. Meeting the Management Challenge: Positions of the Federal Agencies

MEETING THE WILDERNESS MANAGEMENT CHALLENGE: A FOREST SERVICE PERSPECTIVE

Anne S. Fege'

ABSTRACT

The toughest future challenge will be to keep wilderness "affected primarily by the forces of nature with the imprint of man's work substantially unnoticeable." Scientific and conservation values are two globally-important values of wilderness. Many wilderness areas are threatened by air and water pollution, water rights, limits on the natural role of fire and pathogens, resource damage due to commodity uses, and activities related to wilderness administration. Some of the most important wilderness management responsibilities are resource inventory and monitoring, administrative decisions such as the use of minimum tools, training, planning, and public involvement.

INTRODUCTION

Twenty six years ago, the Wilderness Act brought 9.1 million acres into the National Wilderness Preservation System, all National Forest land that had been administratively set aside as early as 1924. Today, the Forest Service is proud of the 33.5 million acres it manages as wilderness, totaling one-sixth of all National Forest land. Almost 85 percent is in the lower 48 states, where the external pressures, recreation use and management challenges are the greatest.

Both professional managers and the public face pressures that diminish wilderness as an enduring resource. This paper addresses wilderness values, management actions to protect those values, and several current Forest Service wilderness management initiatives.

WILDERNESS VALUES

The Wilderness Act calls for wilderness to be "devoted to the public purposes of recreation, scenic, scientific, educational, conservation and historical use." Two of the most important long-term wilderness values are the scientific and conservation values. Recreation, scenic, educational and historical values are not addressed in this paper.

Many wilderness areas provide unequaled opportunities for scientific studies that require ecosystems that are undisturbed by management activities, encompass entire watersheds, have the entire range and habitat needs for various animal populations, or have a mosaic of vegetation types (Greene and Franklin 1988). Research on the structure and function of natural systems provides insights into managing human-dominated systems, and improves management of the wilderness itself.

The future challenge in wilderness management will be keeping it affected primarily by the forces of nature, while managing it for the use and enjoyment of the American people as wilderness.

As development and global environmental changes alter land more dramatically in the future, it is wilderness that can stand as a yardstick against those imprints of man's work and impact on the land. In 100 or 1000 years, the baseline physical and biological information for each wilderness may be invaluable as a benchmark for global climate change, loss of biodiversity, and yet-to-be-identified environmental impacts. As wilderness areas are characterized and monitoring begins, that information will improve wilderness management as well as decisions on situations far removed from wilderness areas.

Wilderness makes an invaluable contribution to the maintenance of biodiversity, a feature that is vital to the health of the total world ecosystem. Wilderness

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areas serve as reservoirs of gene pools and represent many of the ecosystems in the United States. As more forest environments are managed for timber and other uses, wilderness will play an increasing valuable role in providing critical habitat for a variety of plant and animal species.

PROTECTING THE WILDERNESS RESOURCE

Wilderness must be a place "affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable." Yet many wilderness areas are threatened by air and water pollution, water rights, limits on the natural role of fire and pathogens, resource damage due to commodity uses, and activities related to wilderness administration (Fege and Corrigall 1990).

Air Quality

Air pollutants that are deposited on vegetation, soils and water bodies in wilderness may alter ecological processes and natural conditions. Although most air pollution is generated by small sources, there is a provision in the Clean Air Act for protecting air quality in some wildernesses. The Clean Air Act, as amended in 1977, requires that Federal land managers review Prevention of Significant Deterioration source applications and recommend whether they will adversely impact air quality related values in Class I areas. These 161 Class I areas include 88 National Forest wildernesses, all of which exceeded 5,000 acres in 1977. Managers are now beginning to identify air quality related values, select sensitive receptors (indicators), establish monitoring programs, and manage smoke from prescribed fires adjacent to Class I areas (Fox, Bemabo and Hood 1987).

Water Resources

Many wilderness areas incorporate mountaintops and the headwaters of rivers, so water quality and flow are affected primarily by the forces of nature. However, many smaller and lower-elevation wilderness areas are downstream from diversion points, consumptive water uses or pollution sources. The assertion of water rights for wilderness values has now become a conflict in several Western states. Within wilderness, both human visitors and domestic livestock can degrade water quality of small lakes or riparian areas, and such impacts will need to be resolved through public education, regulation, or revised grazing allotment management plans.

Fire, Insects and Disease

Naturally-occurring phenomena such as fire, insects and disease can become very controversial, as their natural ecological role within wilderness can threaten resources and properties outside the wilderness boundary. Lightning-caused fires may be allowed to burn under certain conditions, if prescribed in an approved fire management plan. When fire must be controlled, crews are instructed to be "light on the land," using motorized and mechanical equipment and disturbing the soil only when absolutely necessary in protecting public safety and property. Insect and disease outbreaks are controlled only as necessary to prevent unacceptable damage to resources on adjacent lands or an unnatural loss to the wilderness resource due to exotic pests. For example, control of Southern pine beetle has been approved under certain conditions, and control of gypsy moth infestations in wilderness has recently been considered.

Commodity Uses of Wilderness

The Wilderness Act made special provisions for such nonconforming uses as grazing, mineral claims, water developments, and motorized access to state and private land. Yet, these uses need to be managed in a manner that is compatible with wilderness objectives. Since livestock grazing allotments, private land development and uses, and hunting and fishing customs in certain areas predate their designation as wilderness by several generations, managers need to address conflicts rooted in the issues of local history versus government restrictions on land use.

The balance between wilderness protection and use is a difficult one to reach in practice. Agency policy is that there must be no feasible alternative before a manager allows reconstruction or major maintenance of range improvements; wildlife and fish reintroductions or stocking; or the use of motor vehicles, motorized equipment and mechanical transport to carry out these activities. Except for those needed to perpetuate a threatened or endangered species, wildlife and fish habitat improvement projects are allowed only to protect the wilderness resource and change a condition caused by abnormal human influence. Exploration and development of valid existing mineral leases and mining claims is allowed in Forest Service wilderness, as long as surface disturbance is minor. Motorized and mechanical equipment use must be minimized, and disturbed lands reclaimed and restored to their natural condition as nearly as possible.

Administrative Issues

The Wilderness Act also made special provisions for administrative uses by managing agencies, allowing otherwise prohibited activities (roads, motor vehicles, motorized equipment, landing of aircraft, structures and installations) when "necessary to meet minimum

requirements for the administration of the area." The key words are "necessary" and "minimum." There is a delicate balance in deciding how managers are to set a good example for other wilderness users, and how much is the "minimum" necessary.

Whereas wilderness management benefits from additional scientific information about each area, research must preserve the wilderness character of an area, and be dependent on a wilderness environment. Taking scientific studies to an extreme, a wilderness could be filled with highly visible permanent plot markers, bulky instruments, power lines or electrical generators. While none would advocate that, conflicts arise with decisions about instrumentation, installations, and the use of motorized and mechanical equipment. In 1986, collection of water samples from wilderness lakes for the National Lakes Survey conducted by the Environmental Protection Agency was to be done by helicopter, but Forest Service staff and volunteers helped to accomplish these collections by horse and foot travel.

MANAGEMENT APPROACHES

The future challenge in wilderness management will be keeping it affected primarily by the forces of nature, while managing it for the use and enjoyment of the American people. Wilderness cannot be managed by leaving alone, and some of the most important wilderness management responsibilities are resource inventory and monitoring, administrative decisions such as the use of minimum tools, training, planning, and public involvement.

Resource Inventory and Monitoring

With information about wilderness resources, Forest Service managers can then be advocates for the wilderness resource, and actively protect the wilderness resource from impacts of air pollution, over use, and unnatural ecosystem disturbances. Monitoring wilderness uses and changes in the ecosystem will help managers develop alternatives to protect the resource. The Forest Service Task Force on Wilderness Resource lnformation Needs reported in January on the information needs for effective long-term wilderness management. Their recommendations provide guidance to National Forests on the kinds of wilderness resource inventory and monitoring information to be included in each Wilderness Implementation Schedule, and to managers deciding which data elements will be incorporated into the Geographic Information Systems and other Forest Service-wide information systems. To manage wilderness, information is needed on: ecosystems, global environmental change, externalities, and wilderness use.

Ecosystem Information. Wilderness management is more than setting aside land and leaving it alone. The challenge to managers is to understand the natural processes so well that they will know when the allowed uses need to be managed or limited to maintain those processes. Ecosystem characteristics include flora, fauna, soil, water, and geochemical data, as well as succession and disturbance information.

Global Environmental Change. Critical ecosystems within the National Wilderness Preservation System must be characterized, so they may serve as a baseline for future changes. Monitoring programs need to begin or be continued, so that natural processes within wilderness can be contrasted with the impact of development on land outside it.

Every wilderness decision must protect the wilderness character, values and resource quality over the next 100 to 1000 years.

Externalities. Designation of an area as "wilderness" alone does not assure that wilderness attributes are preserved for future generations. Pressures on wilderness areas from a variety of sources make it necessary to actively manage consistent with wilderness objectives. Externalities address the measurements of resources that transcend wilderness boundaries.

Use Information. The public issues identified in the Wilderness Act are recreation, scenic, conservation, historical, scientific, education, nonconforming uses, and special designations uses. The quantification of these uses in a wilderness and the monitoring of the effects of those uses are essential to responsible wilderness management.

Administrative Decisions

The "minimum skill" or "minimum tool" philosophy should govern most decisions about allowing exceptions for administrative activities; that is, determining the least mechanical or motorized way that wilderness management can be accomplished. Trails are built and maintained without the use of chainsaws in most wilderness, and materials are brought in by pack string rather than helicopter whenever possible. In many wildernesses, there were summer ranger stations, fire lookouts, and trail crew cabins before their designation. These must now be evaluated relative to their cultural resource value, necessity for wilderness administration, and

conformity to wilderness objectives. Line officers need to carefully examine the cumulative impacts of seemingly small decisions, in terms of how they will alter wilderness values in that area, how they will affect decisions in other wildernesses throughout the agency, and how that sets an example for other wilderness users about the spirit of the Wilderness Act.

Training

The future of wilderness depends on the values and skills of today's and tomorrow's wilderness managers and their foundation in wilderness values, issues, and management techniques. Training is needed at all levels of the organization, including seasonal wilderness rangers or volunteers, line officers, and resource specialists that contribute to the interdisciplinary wilderness job. Wilderness management courses typically include aspects of resource management, recreation management, and administration, although the emphasis changes with the job responsibilities. May 7-11, 1990 marks the first Forest Service training for agency leaders (particularly Regional Foresters and Forest Supervisors), the National Wilderness Management Training for Line Officers held at the Ninemile Wildlands Training Center near Missoula, Montana.

Planning

The key to balancing internal resource management pressures is the planning process. For Forest Service wildernesses, broad guidelines are established in the National Forest land management plans. Details are outlined in an implementation schedule prepared for each wilderness by interdisciplinary teams involving specialists in wilderness recreation, forestry, hydrology, range, ecology, archeology, and other disciplines. The wilderness implementation schedule will include the activities, resources and funds needed to manage visitors, outfitters, access, grazing, wildlife and fisheries, fire, administrative support, and issues specific to that wilderness.

Public Involvement

Conservation and constituent groups have focused almost exclusively on wilderness allocation issues, an extremely important job. However, wilderness values can easily be eroded if the public abuses the wilderness resource or managers are not given the financial and political support needed to do a good job. Managers need to know that there is public support for difficult decisions that are made in the interest of wilderness protection. These may include such seemingly small, but additive, decisions to use motorized equipment to open a trail, allow more liberal access to private land or mining claims, allow more visitors to hike in crowded areas, permit outfitters to expand their camps, and retain nonconforming structures and uses.

When conservation leaders and other individuals are part of the wilderness planning process, they are much more likely to feel ownership in the management and protection of that wilderness. The public, as well as local conservation and user groups, need to articulate their support for wilderness management in the Forest Plans, in outreach efforts for the Wilderness Implementation Schedule, and in local projects proposed within or adjacent to wilderness.

CONCLUSIONS

The Wilderness Act calls for us to keep these special areas "unimpaired for future use and enjoyment as wilderness." Managers need to stand firm in allowing natural forces to dominate. There will always be pressures for more human-directed management of wildlife and fire, more exceptions to the use of mechanical and motorized use, more requests for structures that are evidence of human habitation, and pressures for recreational uses that threaten the wilderness experiences of visitors. Every wilderness decision must protect the wilderness character, values and resource quality over the next 100 to 1000 years. With one-sixth of all National Forest land in wilderness and almost 91 million acres managed by all agencies, these challenges can only be met with commitment from every natural resource professional and every wilderness visitor to reduce threats to the enduring resource of wilderness and to fully appreciate wilderness values in this rapidly developing world.

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MANAGING NONRECREATIONAL WILDERNESS USES - THE FISH AND WILDLIFE SERVICE PERSPECTIVE: REMARKS MADE AT THE S.A.F. WILDERNESS CONFERENCE

David E. Heffernan'

It is a pleasure to be here to share some time with you talking about the management of nonrecreational uses of wilderness lands and resources on Fish and Wildlife Service (FWS) lands. On behalf of Director John Turner and myself I want to express our appreciation to all those who have worked so hard to ensure the success of this conference. As many of you know, Director Turner has a strong professional background and deep personal interest in wildlife and wildlands management and all it entails. Coming from Jackson Hole, Wyoming, he is well aware of the beauty and benefits of the wilderness system and extends his support for the objectives of this conference.

I have to admit I was a little puzzled as to the purpose of this conference and where the FWS fits in when I was first asked to participate. The term "nonrecreational uses" brought visions of logging, strip-mining, oil drilling and other exploitive activities. However, as it became more clear what the objectives were I discovered that we do indeed fit in and have a contribution to make in this effort.

In order to put things into a little better perspective, some background information is needed at this point. As you know, the FWS is one of four federal land management agencies containing lands designated as "wilderness" by Congress. When we talk "wilderness" in the Service, we're talking "Refuges", since all of our wilderness areas but one are located within units of the National Wildlife Refuge System. Since enactment of the Wilderness Act in 1964 Congress has designated a total of 71 wilderness units encompassing over 19.3 million acres on FWS lands; 70 on all or parts of 59 National Wildlife Refuges and one on a National Fish Hatchery. No new units have been added since 1980. An additional 26 units, all on National Wildlife Refuges, have been recommended to Congress by the Secretary of the Interior and the President as suitable for wilderness designation but have not yet been acted upon. The review of remaining refuge lands in Alaska for possible recommendation to the President and Congress for inclusion in the wilderness system is still continuing. This review involves nearly 60 million acres and at this point it is impossible to predict how many additional acres, if any, will be proposed.

The Great Swamp Wilderness Area in New Jersey became the first Congressionally designated wilderness on Interior Department lands in 1968 when nearly one-half of this eastern refuge of the same name was added to the wilderness system. A number of additional areas on refuges received formal designation in 1970 (25) and still more in the mid 1970s (over 30). However, by far the ***largest*** acreage increase occurred in 1980, when passage of the Alaska National Interest Lands Conservation Act (ANILCA) increased the wilderness acreage on refuge lands twenty-five fold, from just over 770,000 acres to more than 19.3 million acres. As a result nearly 97 percent of the designated wilderness occurring on FWS lands now occurs in Alaska.

The accomplishment of this goal [protecting biodiversity] is seen as a benefit to society as a whole both now and in the future - thus satisfying both the purposes of the Refuge System and Wilderness Act.

The largest single wilderness area on FWS lands also occurs in Alaska, on the Arctic National Wildlife Refuge. This expansive land, known as the Arctic Wildlife Refuge Wilderness Area and

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encompassing eight million acres or about forty percent of the refuge, is the northernmost unit of the Wilderness System. Five other refuges in Alaska also contain wilderness areas greater than one million acres in size. The largest designated area on FWS lands in the lower 48 states is the Okefenokee Wilderness Area in Georgia, which comprises nearly the entire area of the refuge bearing the same name. This unit of over 350,000 acres encompasses the majority of the Okefenokee Swamp peat-bog community. Most other wilderness areas on refuge lands outside Alaska are 10,000 acres or less in size, and many are islands, some of which only comprise a few acres.

Most of the twenty-six recommended areas awaiting Congressional action occur in the western states, with Arizona and Nevada containing several large proposals, and in eastern and southeastern states, which have a number of small proposals. All of these areas were formally recommended to Congress in 1974 or earlier. At this time a very active Arizona Refuge Wilderness Bill in the 101st Congress, gives some indication that the ten year dry spell in the Service may be nearing an end.

With that background behind us, I'd like to discuss briefly the reasons the FWS exists in the first place, its mission, and more specifically the mission and goals of the National Wildlife Refuge System, since, as I've said, that is indeed where nearly all Service wilderness is located and therefore heavily influenced in terms of ultimate management. In very broad terms, the mission of the Service is to protect and manage the fish and wildlife resources of this country and their habitats for the continuing benefit of the American public. In finer terms, the special mission of the Refuge System is to preserve, restore and manage a national network of lands and waters sufficient in size, diversity and location to meet society's needs for areas where the widest possible spectrum of benefits associated with wildlife and wildlands is enhanced and made available to society. By law refuges are single-purpose areas - set aside for wildlife for the benefit of society. The goals of the Refuge System include preserving natural diversity and abundance of plants and animals, and promoting an understanding and appreciation for wildlife and wildlands as well as providing for high quality wildlife-related recreational opportunities when such use is compatible with the purposes of a particular area.

The Wilderness Act states that..." the purposes of this Act are to be ***within*** and ***supplemental*** to the purposes for which units of the national wildlife refuge system are established and administered." Thus it was not the intent of Congress to change or amend the existing laws governing management of refuges but to super-impose guidelines or constraints over the ***manner*** in which designated wilderness areas are to be managed in the course of striving to meet the objectives established for a particular refuge. The principle of the "minimum tool" needed to accomplish refuge objectives in a safe manner while still protecting the wilderness character of the land was born and serves as our guide on these unique lands.

To some, the idea of "managing" wilderness may seem misleading, particularly those who think of management in terms of changing the land to suit our purposes. Some might even ask, isn't the best management, no management at all? However, I believe that a more complete understanding of "management" in terms of the wilderness resource includes the idea that management involves ***directing the use*** of a particular area or activity.

On many areas monitoring of habitat conditions and protection of the area from overuse or abuse comprises the bulk of the management activity during a given year. Areas such as the Okefenokee Wilderness in Georgia and the Brigantine Wilderness in New Jersey are relatively accessible to large numbers of people and monitoring and enforcement are necessary in order to protect the areas. Controlled fire has been used successfully on some areas, such as the Lostwood Wilderness in North Dakota, as a means of maintaining the area in its natural condition. Wildlife watering facilities may be provided in desert environments if this is the "minimum tool" necessary to accomplish the established wildlife objectives for an area.

There are a variety of nonrecreational uses that can and do occur on Service wilderness areas with the compatibility test along with preservation of the wilderness character being the primary guiding lights.

The Alaska Lands Act provided additional guidance for those wilderness areas designated in Alaska. For example specific provisions in the ANILCA allow for limited motorized access and use, maintenance of wilderness cabins and continued subsistence uses and traditional activities. Congress recognized the uniqueness of these areas and their importance to those who depend on them.

So where does the management of "nonrecreational uses" of wilderness resources fit into this picture?

What are some of these uses and resources and how does the Service view them? As I indicated earlier, among the primary objectives of the Refuge System is the preservation of bio-diversity as well as the protection and management of the many resources found on an area. The accomplishment of this goal is seen as a benefit to society as a whole both now and in the future - thus satisfying both the purposes of the Refuge System and Wilderness Act. The wise use, including complete protection in many cases, of such basic resources as air, water, plants and minerals helps insure that the many needs of society are met - be they physical, spiritual, aesthetic, artistic, survival or a myriad of others. Scientific study and research are allowed and even encouraged in many areas where these activities are compatible with the purpose of the area, do not impair the wilderness values, and particularly when results from such studies can be expected to improve management capabilities on the area. As resource professionals we would be operating with our heads in the sand if we tried to ignore the fact that resource development will continue to occur in what we consider to be "pristine" ecosystems. It is imperative that we have biological facts that can be obtained only through diligent, directed research to ensure that fragile parts of ecosystems are protected. To be effective, it is important that research results get into the hands of the user and the wilderness manager. Studies should be designed to support and relate back to priority management questions whenever possible. The most valuable studies from a management standpoint are those that are "cause-effect" designed and addressed to clearly identified management questions.

The protection and care of cultural resources--our past and what we've learned so we can apply it in the future--is another important factor to the resource/wilderness manager. Although a relatively small program on many refuges, awareness of its importance ensures that society's interest are safe-guarded for future generations. In terms of the preservation of historical uses as called for in the Act, the subsistence program on Alaska refuges wilderness areas recognizes the importance of the wild, renewable resources to the rural residents of the State of Alaska. So important is this historical use that Congress determined in the ANILCA of 1980 that non-wasteful subsistence uses would have priority over all other uses if restrictions were necessary. So we see there are a variety of nonrecreational uses that can and do occur on Service wilderness areas with the compatibility test along with preservation of the wilderness character being the primary guiding lights.

So what of the future? Wilderness management whether for recreational or nonrecreational uses is certainly an important aspect of refuge management, but it is only one of many in terms of overall management of the National Wildlife Refuge System. We are now in the process of developing and re-evaluating overall system policies that will provide guidance for the System into the 21st century. We've titled this process "Refuges 2003 - A Plan for the Future." Wilderness management is a part of this effort. We will be seeking your input and support into this important task and trust you will oblige as the plan is developed over the next few months.

These are exciting times for us in the FWS. Not only do we have a new ***Director*** who is vitally interested in the long-range success of our agency, we also have a ***President*** and a ***Secretary*** who have openly indicated their love for the outdoors and all its aspects.

At the same time these are extremely ***challenging times.*** Competition for limited resources is often strong. The resources entrusted to us are under unprecedented siege and strain, and we're charged to meet this challenge head-on! I believe that we can and will. Working together I believe we can continue to provide that unique and immeasurable experience called for in the Wilderness Act:

> ***"an enduring resource of wilderness... retaining its primeval character.... managed so as to preserve its 'natural condition.... for the use and enjoyment of the American people, now and in the future."***

This seems to me to be a very worthy cause to pursue into the 21st century. Thank You

A BALANCED PERSPECTIVE ON WILDERNESS USE

Jenness Coffey'

ABSTRACT

A look at the administrative record of the National Park Service's Wilderness Management Program reveals an evolution in the agency's perspective on the value of wilderness. In the early years of the management program, the Service tended to view the value of wilderness mainly in light of the recreational use that wilderness received. This perspective on wilderness began to broaden in the early 1980s with the acknowledgement by the Service that wilderness has value for its nonrecreational resources in addition to its value for recreational uses. This more balanced perspective is today reflected in the approach which the Service is taking toward wilderness planning, management and research.

INTRODUCTION

The National Park Service (NPS) has extensive management responsibilities under the 1964 Wilderness Act. Designated wilderness is found in 43 wilderness areas located within 42 units of the National Park System. With over 39 million acres of designated wilderness, the NPS manages more wilderness than any other agency. In fact, almost ***49*** percent of the 80 million acres of land under the administration of the NPS has been designated wilderness. Recommendations for designation of an additional 20 million acres in 25 areas are currently pending with Congress or the administration.

This paper addresses the position of the NPS with regards to nonrecreational wilderness resources based on the administrative history of the agency's perspective on wilderness. That history, as contained in the administrative record of wilderness management, shows that the agency's perspective on nonrecreational wilderness resources has been evolving in response to changes in its perspective on the value of wilderness. The administrative record on which this is based consists of speeches presented by current and former Directors and Deputy Directors, the reports of two separate NPS task forces on wilderness management, a report of the Wilderness Management Coordinator's Workshop held by the NPS, as well as various memoranda, briefing statements, program plans and project statements related to the management of NPS wilderness areas.

[The National Park Service's] perspective on nonrecreational wilderness resources has been evolving in response to changes in its perspective on the value of wilderness.

THE NPS PERSPECTIVE ON WILDERNESS DURING THE 1970s

The first wildernesses to be designated within the National Park System were at Craters of the Moon National Monument and Petrified Forest National Park in 1970. It is clear from the administrative record described above that the value of wilderness in National Park System areas during the 1970s was seen to lie almost solely in the recreational use that the wilderness (and areas pending wilderness designation) received. Evidence of this can be found in the report of the **Wilderness/Backcountry** Task Force which the NPS convened in the mid-1970s to address pertinent issues in wilderness and backcountry management (NPS 1976). Significantly, the report shows that the first eight of the subjects addressed by the task force related directly to the magnitude of recreational use that the backcountry was receiving. Among the highest priority issues discussed were the establishment of use limits, the development of a permit system, and whether to

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develop a servicewide system for backcountry reservations.

The concern for the magnitude of use displayed during the 1970s was a reflection of the high volume of backcountry use which the national parks were experiencing at the time. Intense pressure was being placed on the natural resources in many parks by the high amount of backcountry use those parks received. This was true not only in wilderness areas, but in nonwilderness backcountry as well.

THE NPS PERSPECTIVE ON WILDERNESS DURING THE 1980s

The 1980s brought a change in both the amount of visitation that wilderness received and the perspective of the NPS regarding the management of wilderness. The Service began to acknowledge that wilderness has value for its nonrecreational uses as well as for its recreational uses. One of the first indications of the emergence of this new, more balanced perspective was a lecture which was delivered in November, 1981 to the Wilderness Research Center at the University of Idaho by the then Director of the NPS Russel Dickenson. In that lecture, which was entitled 'Wilderness Values in the National Parks', former Director Dickenson said, "I have found, on recent visits to parks, that there is a renewed resource awareness all across the service. The welfare of the NPS's natural and cultural resources has become a principal concern of the hundreds of park rangers and other dedicated employees working at all levels within the system" (Dickenson 1981).

The nonrecreational values of wilderness can be seen in terms of people and their needs just as recreational use is seen in such terms.

Former Director Dickenson then went on to identify the value of wilderness in perpetuating rare and unique species. He also said that the parks "may hold the future for the fuel needs of the world". He felt that some species found in the parks may be the key to a yet unknown power source. He also addressed placing greater emphasis on the acquisition of baseline data and stressed the scientist's role in wilderness.

This broadened perspective on wilderness which was emerging in 1981 arose at that particular time as a result of the 1980 'State of the Parks' Report to Congress (NPS 1980). In that report, the NPS for the first time assessed the condition of its natural and cultural resources on a Servicewide basis. That assessment served as a catalyst to begin to focus attention on some of the natural resources which were being seriously threatened by a wide assortment of activities, including the overuse of the parks which had occurred during the previous decade.

The NPS convened a second task force, the 'Servicewide Task Force on Wilderness Policy and Management', in the mid-1980s (NPS 1986). Unlike the wilderness task force of the mid-1970s, however, the task force of the mid-1980s concentrated not on the magnitude of backcountry use, but rather on the infrastructure of wilderness management in the NPS. The focus of this task force centered on subjects such as management techniques appropriate for wilderness, education and training of wilderness management personnel, and education of the public. Positive management action, including the designation of Regional and Park Wilderness Coordinators resulted from this task force.

The position of the NPS with regards to nonrecreational wilderness resources has been emphasized most recently in the speech presented by Deputy Director Herb Cables at the 25th Anniversary Wilderness Conference in September of 1989. In that speech, Deputy Director Cables said, "I would like to point out that we, as managers, must begin to focus greater attention on the nonrecreational uses of wilderness. Within the next several years the wilderness inventory will be essentially completed for all Federal agencies. At the same time, backcountry overnight use, the traditional focus of wilderness managers, is experiencing a decline on a nationwide basis. These two factors will provide an opportunity to refocus our energy on the management of the nonrecreational uses of wilderness. These uses are no less important than the recreational uses which occur in wilderness areas" (Cables 1989).

Deputy Director Cables then went on to identify several valid nomecreational uses of wilderness, including the value of wilderness in providing an opportunity for the protection of genetic diversity, the value of wilderness in watershed protection, and the protection of important wildlife resources, as well as the opportunity to provide commercial outfitter guide services. The function of wilderness as a mechanism for the protection of both historic and prehistoric cultural resources was highlighted. Moreover, the Deputy Director pointed out that in some locations, such as Alaska, wilderness areas provide opportunities for subsistence uses, including hunting, fishing and plant harvest.

THE NPS PERSPECTIVE ON WILDERNESS IN THE 1990s

As we enter the 1990s, there is a growing trend in the environmental sector toward adopting a global view. The NPS itself is currently in the process of developing a servicewide program to study global climate change. This will no doubt influence the perspective of the NPS on wilderness. Those wilderness areas which are forested help maintain a healthy balance of gases in the atmosphere. This is important with so much of the earth's forests being destroyed. And, since commercial timber harvesting is not allowed in wilderness, the value of forested areas protected from commercial harvest by wilderness designation will become even more important in the future.

The above outlined trend of acknowledging the nonrecreational value of wilderness is still viewed by the NPS in anthropocentric terms. As former Director Dickenson pointed out, "We must see parks and wilderness in terms of people and their needs" (1981 lecture). That statement is as applicable today as it was in 1981. However, the nonrecreational values of wilderness can be seen in terms of people and their needs just as recreational use is seen in such terms. Global issues affecting the enviromnent in which we live are becoming more central to the concerns of society every day. As this occurs, the nonrecreational values of wilderness begin to fill the needs of people to a greater extent than ever before.

CONCLUSION

The NPS has always had a dual mission -- to conserve the resources while providing for the enjoyment of visitors. That mission, as contained in the 1916 Organic Act, is "to conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such a manner and by such means as will leave them unimpaired for the enjoyment of future generations." Thus, by adopting a more balanced perspective towards wilderness, the NPS has actually come more in line with its mission.

In concert with its mission, the NPS remains dedicated to providing a quality wilderness experience for recreational users. But, by adding the value of the natural and cultural resources to the traditional value of the recreational use of wilderness, the NPS is gaining a more balanced perspective on wilderness. This more balanced perspective is leading the NPS to a more balanced program of wilderness planning, management and research.

A current example of a balanced approach which is being taken by the NPS to address a wilderness management problem is the research on the effects of aircraft ovefflights in units of the National Park System. This research program, mandated by Congress, was initiated due to the impact of noise from aircraft overflights on the visitor experience of solitude in the backcountry. This research, however, will not only provide information regarding the impact of noise on the enjoyment of park visitors; it will also include a study of the injurious effects of aircraft ovefflights on the historic and prehistoric cultural resources. This reflects the balanced perspective on wilderness present in the NPS today.

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BLM WILDERNESS: A MYRIAD OF MULTIPLE USES

Keith Corrigall

My discussion today will center on multiple uses in the Bureau of Land Management (BLM). The major thrust of my presentation will be to discuss the various and numerous multiple uses that are occurring on BLM wilderness areas and that will continue to occur in the future.

Several years ago, Pat Reed and Glenn Haas and others approached the BLM to see if we would be interested in getting more deeply involved in analyzing and evaluating the nomecreational uses of wilderness. BLM was very interested in nonrecreational uses of wilderness, and continue to be because, from our selfish stand point, the vast majority of BLM wilderness areas are valuable for these other values and uses. They are not primarily recreation type areas, and have more of the other values that we have talked about--scientific, historic, and cultural. For this reason my presentation hoped that the theme of this conference was managing for the 20th century rather than the 21st century. Agency people are addressing these issues now. We can not wait until the 21st century to get smart in this area, we need to get smart now.

Let me discuss briefly where we are in the BLM with respect to nonrecreational uses. We are just barely getting started! I mentioned that the BLM is the last agency to come into the System. We have the smallest acreage of any of the agencies because we are just getting started. The BLM has 28 areas, covering approximately 475,000 acres. We are at the stage of getting our studies and recommendations ready to go to the President and Congress.

I am convinced that in the next 25 years or 50 years, the major emphasis in the wilderness program is going to be on the nonrecreational uses. The reason for making this forecast is because we are already seeing the change. Researchers are already working on the change. Researchers are already reorienting their scope of inquiry and interest. For example, a national colloquium was held in Tampa two years ago on nonrecreational wilderness values. We also note the Southeastern Forest Experiment Station has developed a major charter revision in their goals about emphasizing nomecreational uses. In the Society of American Foresters (SAF), there is even talk about splitting out of the wilderness subgroup a select group that would work on nonrecreational wilderness values only as a specialty.

Federal agency managers are becoming more and more attuned to the nonrecreational aspects of wilderness. They are not doing it totally voluntarily, I might add, but it is being brought about by the increasing pressure being applied by both resource interests and also by the agency staff itself.

The whole dialogue and interest in issues and concerns are trending more to the nonrecreational aspects.

Congress is also getting more into the wilderness game. They are having to deal with more and more of the nonrecreational interests. At any of the recent hearings held in the Congress you will not see the same types of only recreation interests groups that have been testifying on wilderness bills. You are getting an increasing number of nomecreational type organizations interested in wilderness and the implications for nomecreation values and uses of wilderness areas.

Secondly, the conservation groups, and the environmental cormnunity in general, feel the nonrecreational aspects of the wilderness program may be their last chance to salvage what little is left of the wilderness scene in America for uses other than solely recreation.

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The general public is also recognizing the situation of more conflicts between recreation and nonrecreation uses of wilderness. Lastly, a reason there is an increasing interest in nonrecreational uses of wilderness is that the issues and the concerns seem to be re-orienting. At this conference we have heard a number of presentations and papers on topics such as global warming, threatened and endangered species, wildfires, gene pools, and others. The whole dialogue and interest in issues and concerns are trending more to the nonrecreational aspects.

These reasons and changes are why the BLM is obviously interested in the nonrecreational aspects of wilderness. BLM has some of the most diverse areas that will be added to the National Wilderness Preservation System and the BLM areas will have the most varied types of uses that are going to be made of such areas. Examples to give you a perspective on what the BLM hopes to bring to the wilderness system follow.

One example, is the nonconforming use of providing access to private and state owned lands and interests located within the wilderness areas. BLM has approximately two million acres of state and private inholdings located inside wilderness study areas. If all of those areas are designated as wilderness, it means access must be provided to the owners of the two million acres of state and private lands within BLM wilderness areas. In most of these areas owners will be asking for access, or asking to be exchanged out, or asking to have their lands purchased. This could generate a massive acquisition program which will have many problems.

In terms of grazing, as has been previously mentioned, the domestic livestock market itself may take care of many of the grazing conflicts. In many cases it will not be cost effective or financially efficient to continue grazing operations in wilderness areas with the management constraints that are in effect in such areas. It would be extremely naive working in the BLM to think that the grazing voices and influences are still not going to be heard loudly for the next decade and probably for the next 25 years.

Another major problem for BLM and one that is more readily apparent than the grazing aspects is the issue of mining claims. In BLM wilderness study areas, as we attend this conference, mining claims are being located under the United States mining laws. Such locations are legal and provided for by law. The BLM does not have an accurate count of how many mining claims there might be in these wilderness study areas, but it will probably number in the six figures.

By six figures, we mean in the hundreds of thousands of mining claims that are staked inside wilderness study areas and that ultimately could be located within BLM designated wilderness areas. By sheer size, this will trigger conflicts between nonrecreation uses and the mining industry. This will also generate a significant workload in validity examinations that will be needed to be conducted by geologists and mining engineers to establish if the mining claims are legally valid. This type of nonconforming use was grandfathered in by the terms of the Wilderness Act as valid existing rights.

A similar situation has occurred in terms of oil and gas development. We have thousands of issued oil and gas leases that are inside BLM wilderness study areas. BLM has not issued any new leases in a number of years because of a congressional prohibition. However, there are old leases that were issued prior to the prohibition. A number of these oil and gas lease operations could ultimately be included in the designated wilderness areas of BLM.

Cultural resources management is also a major program for the BLM because of the location of BLM lands in the arid Southwest and culturally rich Native American areas. Watchable wildlife programs are major new initiatives under way by both BLM and the Forest Service with wilderness serving as non-consumptive use areas for wildlife rather than only for hunting purposes.

BLM has some of the most diverse areas that will be added to the National Wilderness Preservation System and the BLM areas will have the most varied types of uses that are going to be made of such areas.

Paleontology is another problem, particularly for the BLM. Because BLM wilderness areas are potentially rich in fossil resources, requests to excavate dinosaurs and other fossil resources will continue to be made by the scientific community, especially with the increasing public interest in paleontology.

BLM has also had problems in working with Indian people because of the location of religious sites on wilderness areas. Language has been included in a New Mexico wilderness bill that allows Indian religious activities to continue to take place in

wilderness areas. Similar language is also included in pending Arizona and California wilderness bills.

The uses previously discussed are only a few of the various nonrecreational uses. People say why is BLM concerned, if BLM has so few acres now in the System?

BLM efforts are just starting up or winding down, depending on your perspective. The BLM has approximately 25 million acres under wilderness study. BLM is presently processing final wilderness suitability recommendations to the Secretary and to the President. BLM is processing recommendations on a statewide basis, and they will be submitted on a state by state basis. Of the 25 million acres, BLM has tentatively recommended approximately 12 to 14 million acres as suitable for wilderness designation.

Whether this total is the final figure is anybody's guess and typically it will probably be higher. Congress historically designates more than the Federal agencies have recommended.

Thus, BLM could conceivably add another 20 million acres to the National Wilderness Preservation System. The BLM study program does not include Alaska acreage. If BLM lands in Alaska are included then the 20 million figure could go even higher.

We have talked about the present, and the myriad of uses but what is the potential? Again, for BLM there is opportunity to add diversity to the National Wilderness Preservation System. The general public is not used to having BLM as a part of the wilderness System. We are going to have many problems with the general public. BLM will continue to be confronted with more and different types of demands. We are experiencing these other types of demands for all types of uses on the public lands and are already seeing the conflicts between nonrecreation users and recreation users. We have increasing demands for all of the consumptive type uses. We have had some encouraging news the last year or so. The wilderness budget crisis seems to be easing up somewhat in the BLM. We have new leadership that is finally emphasizing the fact that it will cost to manage wilderness and to manage it properly.

One of the future problems for BLM in wilderness is that we are a victim of our own success. We have talked up multiple use and now many people will come to BLM and say, "Why can't I use that wilderness area for this, this and this?" The BLM wilderness manager will have to say "No" to many of these requests. The BLM is going to get caught between these conflicts of multiple use.

In terms of disciplines, traditionally the BLM has been the home of range conservationists, foresters, geologists and a few other consumptive use types or skills. Obviously, these traditional skills are not going to totally work. Today, and in the future, we are going to need more botanists, limnologists, paleontologists, soil scientists, biologists. You name it, we are going to need different kinds of disciplines than has traditionally been the case. In terms of legislative direction, we are experiencing an increasing interest by the Congress in what is going on with respect to the wilderness System. Most people have probably thought the big battle to date has been over the acreage count.' Congress, through Subcommittee Chairman Vento, is taking an increasing interest in the System after its designation. That interest will probably intensify. BLM is encouraged by this. It is a healthy sign to see the Congress interested in the System it has built.

Lastly, a key point is the dedication of the BLM people. Again, we are new in the wilderness System. We have many dedicated employees and managers that are more than willing to take on the wilderness challenge. BLM is looking forward to what is termed a consortium approach where we have the Congress helping, the agency people working together on a systemwide coordination basis with the other federal agencies, and with the conservation community. Increasing interest is occurring by groups such as The Wilderness Society, Defenders of Wildlife, and the Sierra Club in participating in wilderness management.

Between the Congress, the agencies interest, as well as the environmental community, there will be more and more attention paid to the nonrecreation uses and values in wilderness areas. BLM, because of the diversity of the public lands, will be a major recipient of that interest and attention--both good and bad. BLM looks forward to wilderness management now and the 21st century.

PART V. Meeting the Management Challenge: Roles for Others

CONGRESSIONAL LEADERSHIP IN WILDERNESS MANAGEMENT

James Bradley*

For ten years, I had the opportunity to be a wilderness ranger and a wilderness management officer for the Forest Service. I worked in three beautiful areas--Selway-Bitterroot Wilderness in Idaho, the Eagle Cap Wilderness in Oregon, and the Hell's Canyon Wilderness in Idaho and Oregon. It is wonderful to see several of the colleagues that I worked with over those years here in this room today and to see that you are still dedicated to the cause of quality wilderness management.

I learned a lot from those years in the wilderness including how to pack a mule, how to cut out a trail with a crosscut saw, how to find caches that outfitters had hidden back in the woods and how to tactfully tell visitors what to do with their human wastes. These are not skills normally associated with congressional staffers, but I have found that much of what I have learned in wilderness does apply to working in Congress in Washington D.C. For example, there is not a whole lot of difference between running a pack train or passing a bill. The principle is basically the 'same whether you are dealing with Congressmen or mules. You have to get a bunch of cantankerous, stubborn, independent individuals to all head down the trail in the same direction and sometimes it takes a two-by-four on the part of the packer or a Committee chairman to achieve this goal.

There is one lesson, in particular, that I learned when I was in wilderness that I took back with me to Washington. That lesson is an old lesson for everyone in this room, but in Congress it is new. It is quite simple. The battle to preserve wilderness is not over when Congress passes a wilderness bill. Instead the battle has just begun. Congress has not thought of wilderness in this way. When I arrived three years ago, Congress had designated 91 million acres of wilderness, but no one had stopped to look at what happened to all those acres after they were designated. Congress had held hundreds of hearings on wilderness designation, but not one single hearing on wilderness management. Congress had given the Forest Service a total budget of $3 billion, but had allocated only $10 million of this total for the management of the Forest Service's 32 million acres of wilderness. It is clear that Congress thought its job was done when the designation battle was over.

I am fortunate to have a boss, Congressman Bruce Vento, who has decided to do something about this sorry state of affairs and to fight the post designation battle. Vento is calling for a second wilderness revolution. The first revolution was to get the areas designated. The second one is to make sure that they are managed right. He has made bringing quality wilderness management to the land management agencies one of his highest priorities. He is in a good position to lead this fight because he is Chairman of the Subcommittee on National Parks and Public Lands which is part of the Committee on Interior and Insular Affairs in the U.S. House of Representatives. Vento's Subcommittee has jurisdiction over legislation and issues dealing with the Forest Service, the National Park Service, the Bureau of Land Management, wilderness, historic preservation, and outdoor recreation. The wilderness bills that established the National Wilderness Preservation System passed through this Subcommittee, and continue to pass through this Subcommittee. It is quite natural for the Chairman of the Subcommittee now to want to ensure that all the lands that the Subcommittee spent so much time setting aside are managed well.

The battle to preserve wilderness is not over when Congress passes a wilderness bill. Instead the battle has just begun.

Most people probably think that only the land management agencies have a leadership role in actually managing wilderness, but Chairman Vento thinks otherwise. He believes that Congress also must exert leadership. There are four ways in which leadership from Congress can benefit wilderness management.

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First, Congress needs to increase wilderness management funding. You need more money to do this job. Ten or twelve million dollars in the Forest Service for a 32 million acre system is just not adequate. For the past three years, Congressman Vento has gone to the Interior Appropriations Subcommittee and asked specifically that it raise the amount of money for wilderness management. Because of the support of Chairman Yates, these efforts have resulted in increases for the Forest Service for the wilderness management line item.

One reason why it is so difficult to give wilderness more dollars is that the agencies and the Administration are not asking for the money. Congress always has to tack on extra funds after the Administration sends us its budget request. This year we did some snooping around and discovered just a few days before the Administration's budget proposal came to Congress that this budget was giving wilderness management a significant cut, despite the fact that the rest of the Forest Service recreational budget was getting a dramatic increase. Only after we protested to the Chief of the Forest Service was the budget request changed. You need to work harder to make sure that the agencies and the Administration actually are requesting the funds that you need to manage wilderness.

A second way Congress can provide leadership is through Congressional oversight. Congress has an obligation to oversee how well the federal agencies are implementing the laws that Congress passes. To fulfill this responsibility, Chairman Vento held Congress' first wilderness management oversight hearing. It is nice to see that there are several people in this room who came back for that hearing and testified; for example, Linda Merigliano who testified as a wilderness ranger, and Joe Roggenbuck who testified as a research scientist. They and other witnesses told us that there was much work that still needed to be done for wilderness management and that under the present inadequate management much of the wilderness resource was deteriorating. Also, as part of our oversight responsibilities, the Subcommittee asked the U.S. General Accounting Office, the investigative branch of Congress, to do about a eighteen month study of Forest Service wilderness management. Their study substantiated many of the findings of the hearing.

A third leadership role for Congress is to spot light the wilderness management issue. Congress can make people who have ignored wilderness management focus on it for the first time. For example, the GAO study and the oversight hearing attracted news media attention. Linda and some of her wilderness ranger colleagues appeared on television news broadcasts throughout the nation. Perhaps even more important than news media coverage, however, is getting the attention of the leaders in the agencies that manage wilderness.

Because of the oversight hearing, George Leonard, Associate Chief of the Forest Service, testified on the issue and personally met with each of the wilderness rangers to discuss their concerns. He probably had not focused much on this issue before and hopefully learned much from this experience. Vento has followed up with Dale Robertson, the Chief of the Forest Service, by writing and talking to him on many aspects of the wilderness management program. We are determined not to let the Chief and his staff forget about wilderness.

Finally, Congress can provide leadership for wilderness management by passing legislation that directs the agencies to improve their wilderness management programs. We have not taken this step yet, but it may be coming. If the agencies resist joining the wilderness management revolution and neglect to make the significant changes necessary, directing them through legislation may be the only option left.

Most people probably think that only the land management agencies have a leadership role in actually managing wilderness, but Chairman Vento thinks otherwise. He believes that Congress also must exert leadership.

Congressman Vento has a vision of how the agencies should be managing their wilderness programs. This vision is essentially the same as that expressed by the theme of this conference--that wilderness areas are not just recreation areas; that the wilderness is a resource in its own right with recreation as just one of many uses and purposes; and furthermore, that the wilderness resources are equal to and should have the same emphasis as the other resources managed by the agencies. In the past, the timber program, the range program, the minerals program, the wildlife program and many other programs have consistently received more attention than the wilderness program.

Chairman Vento and the Subcommittee have identified three key changes that must take place to make this vision happen and ensure that wilderness receives the priority it needs and deserves. First, the agencies need directorships of wilderness. The Forest Service should have a director of wilderness in its Washington Office, and a director of wilderness in each of its regional offices. Since there are directors of minerals, wildlife, range, recreation and timber, how can we say that

wilderness is an equal resource, getting its proper emphasis when it is buried inside the recreation program with only one employee with full-time wilderness responsibilities out of the entire 700 person staff of the Washington office? All these other programs have large staffs in both the Washington and regional offices.

Some people are concerned that if we create directorships for wilderness it will take money from the field. We believe that the opposite would happen. These directors would be advocates for the wilderness budget and for strengthening the wilderness program. They would have access to the Regional Foresters and the Chief and would make sure that the necessary funds were being requested.

The second change that needs to take place is to redraw the unit boundaries in the Forest Service in a way that gives wilderness more emphasis. The existing boundaries for many ranger districts, national forests and regions may no longer be appropriate. Wilderness areas have been dropped as overlays on top of these units. Now that wilderness has become a major land allocation, it is time for the Forest Service to rethink these boundaries. With the present units, many wilderness areas are so subdivided among ranger districts, national forests and even Regions that often no one unit has enough of a particular wilderness to hire full-time wilderness staff to give it proper emphasis. A typical ranger districts will have a little comer of the wilderness and simply tack wilderness onto a resource assistant's job description. That individual has so many other responsibilities that wilderness receives scant attention. However, if the ranger district had an entire wilderness, it would be able to hire a professional wilderness management officer with a staff who could manage the whole wilderness on a full-time basis.

The most notorious example of the problems caused by subdividing wilderness is the Frank Church-River of No Return Wilderness in Idaho. The Frank Church is divided among two regions, six national forests, and twelve ranger districts. The poor coordination and lack of emphasis has become such a problem that Congressman Stallings of Idaho has taken steps to do something about it. He has asked the Forest Service to develop a plan to reorganize their administration of this wilderness. If this plan is unacceptable, he may consider introducing a bill to direct the Forest Service to give the Frank Church more coordinated management. Perhaps the ideal solution would be to designate a Frank Church-River of No Return National Forest, making it the nation's first all wilderness national forest.

The third change needed is to have full-time professionals running the wilderness program. Right now most of the Forest Service wilderness program is managed by dedicated seasonal employees and volunteers who come back year after year. We need to create more professional wilderness management positions to enable these people to rise in the ranks and to ensure that we make full use of their expertise in wilderness. There is no other resource in the Forest Service that is run in as lackadaisical way as the wilderness program. For example, there are professionals year round managing the timber, wildlife, recreation and range programs.

The Bureau of Land Management is a positive example of an agency that has taken some of these steps that I have been discussing. The BLM actually has a wilderness organization with a director in its Washington Office. Under Director Keith Corrigall there are seven wilderness positions in Washington compared to only one for the Forest Service. These positions are filled by individuals who rose in the ranks in wilderness. This was possible because the BLM also has full-time wilderness positions in its state and district offices. In fact, the BLM has over a hundred professionals in wilderness management the most of any wilderness management agency.

The Forest Service is making progress and has started some new and creative programs. Anne Fege, its wilderness coordinator, has a lot of energy and has been a positive influence. There are now more wilderness education programs and more training in wilderness for Forest Service employees. For example, the agency has established a wilderness training center at the historic Nine-mile Ranger Station in Montana. Region I has created a new wilderness management position that does not report to the Director of Recreation, but to all of the Regional staff directors.

The Forest Service, however, has not taken the big steps necessary to bring about a true revolution in wilderness management that would make wilderness more than a recreation program. The Forest Service seems very hesitant to create directorships of wilderness, to redraw unit boundaries, or to create more professional management positions. As a result, maybe it is time for a second wilderness act, a wilderness management act that actually would direct the agencies to make these changes. This act could establish Directors of Wilderness, a national education program for wilderness visitors, a more comprehensive wilderness research program, a national wilderness training center, and new unit boundaries. Hopefully, the agencies will still make most of these improvements on their own, but if they do not, Congress has an obligation to fulfill its leadership role and a wilderness management act may be the most effective way to bring about the revolution.

WILDERNESS RESEARCH: POSSIBLE PITFALLS AND POTENTIAL SOLUTIONS

Joseph W. Roggenbuck*

ABSTRACT

Wilderness research has increased in sophistication and complexity since the passage of the Wilderness Act in 1964. However, to improve wilderness management and increase benefits, additional research must identify all the values of wilderness including vicarious values, focus on basic ecological values, study the impacts of all wilderness users, look beyond the wilderness boundaries, study fragile wilderness ecosystems, test methods of site rehabilitation, determine use-impact relationships to support LAC management, and identify the learning and land ethic values of wilderness use. These research goals might best be accomplished by considering the big picture, taking an interdisciplinary approach, emphasizing the context, doing theory-based research, involving the right academic disciplines, doing studies across time, doing field experiments, and studying wilderness behavior. These recommendations might be implemented through increased funding, continuity of funding, publishing and sharing research results, coordination among managers and researchers, funding cooperative, university research, especially graduate student research, solving problems outside wilderness, and as a last resort, amending the Wilderness Act to mandate science as a recognized value of wilderness.

INTRODUCTION

When managers are faced with difficult or controversial decisions regarding the protection and appropriate use of wilderness, they turn to the Wilderness Act (PL 88-577) for direction. Researchers too must work within the guidelines of the Wilderness Act. Thus, when I was asked to speak about the possible pitfalls and potential solutions regarding the role of research in solving wilderness management problems, I turned first to legal direction, The problem is that the Wilderness Act, like most laws, institutionalizes or codifies broad social values, and establishes general direction to attain and protect these social values. The Wilderness Act states that its purpose is to secure "for the American people of present and future generations the benefits of an enduring resource of wilderness." The law goes on to state that managers must administer wilderness for "use and enjoyment of the American people," "leave them (the areas) unimpaired for the future use and enjoyment as wilderness," "provide for the protection of these areas" and "the preservation of their wilderness character" (Lucas 1987). The law does not state whether, what kind, and how much research should be carried out in or about wilderness to protect these mandated societal values.

Our past tendency to focus our research on only the recreational values of wilderness has contributed to the erroneous conclusion by some that wilderness is a single-use resource. This has hampered the movement to protect a diversity of areas in the National Wilderness Preservation System.

The Wilderness Act does, however, indirectly or implicitly recognize the value of research. For example, the Act recognizes that wilderness may have scientific, educational, or historical values. It also states about wilderness that "gathering and dissemination of information regarding their use and

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enjoyment as wilderness" shall be accomplished. This implies a role for research (Lucas 1987). Given these general mandates and the inevitable informational needs of protecting and managing a legally defined system of resource values which is the first of its kind in the world (Eidsvik 1987), research in wilderness has been a common and accepted practice. Indeed, the USDA Forest Service has established a wilderness research unit in Missoula, Montana, and all four federal agencies with wilderness jurisdiction fund and support wilderness research.

Once problems, causes, and relationships are understood, research needs to help managers develop tools to influence land use planning and management decisions on lands over which they have little direct jurisdiction.

Today, I would like to briefly discuss some of the strengths, weaknesses, and potential improvements of wilderness research. More specifically, I would like to comment on what has and should be studied, how research questions have and should be stated, how research has and should be carried out, and how we might accomplish more research with more benefits to wilderness managers. As I do this, I will draw on examples from past wilderness research and from speakers at this and previous wilderness management conferences.

APPROPRIATE CONTENT OF WILDERNESS RESEARCH

Several authors have commented on and criticized the content emphasis of past wilderness research (e.g., see Lucas 1987; Franklin 1987), and I share their concerns. My own analysis of the needs for shifts in research focus follows.

Identify All the Values of Wilderness

Wilderness research with the highest profile has typically been carried out or sponsored by the USDA Forest Service, and most of this has dealt with recreational values and issues. While recreation is an integral and legally authorized value of wilderness, it is but one of many values. The Wilderness Act indicates that wilderness has values of naturalness, i.e., areas where the structure, functions, and processes of ecosystems are untrammelled by man. The Act also recognizes that wilderness may contain scenic, historical, scientific, and educational values. It also permits several so-called nonconforming uses within wilderness, like carefully managed grazing or mining. But we don't know as much about these values, e.g., how much they are valued, the relationships among each value and also recreation, their dependence on wilderness conditions, and conditions necessary for their protection. One of the purposes of this conference is to begin to better define these non-recreational values.

Our past tendency to focus our research on only the recreational values of wilderness has contributed to the erroneous conclusion by some that wilderness is a single-use resource. This has hampered the movement to protect a diversity of areas in the National Wilderness Preservation System. Also, recent studies indicate recreational use has stabilized or is even declining in many wildernesses (Stankey 1987; Lucas and Stankey 1989). If this trend continues, obtaining political and financial support for wilderness allocation and management on the basis of recreation might be difficult.

Identify the Vicarious Values of Wilderness

A relatively small proportion of Americans visit wilderness, yet support for the wilderness ideal and for the protection of wilderness areas is very high. This suggests that the vicarious user, i.e., the user who only dreams of wilderness and enjoys if from afar, is likely far more numerous than actual users (Driver and others 1987). We know almost nothing about these people. We don't know how many of them there are; we know little about their characteristics; we know little about the meanings and values they ascribe to wilderness, and we don't know if they are growing or declining in numbers.

Focus on the Basic Ecological Values of Wilderness

The features of naturalness, high complexity and diversity, grand scale, and high degree of integrity and continuity are the unique features of ecological systems that define wilderness (Franklin 1987). These values define wilderness character, and the primary purpose of the Wilderness Act and wilderness management is to protect wilderness character. Primitive and unconfined recreation is the other primary wilderness value, but is dependent on wilderness character. Thus, if naturalness is lost, so is wilderness recreation.

We have done far too few studies to permit an understanding of the dynamics, structural components, and functions of wilderness systems. When we have studied natural processes, we have too often focused on appearances of naturalness, and not on naturalness (Franklin 1987). We have asked wilderness visitors if they perceive impact problems on their campsites, or if the amount of trail erosion has increased since their last visit. Such judgments are meaningful in understanding the recreational experience. They help little in understanding sickness of natural processes. Recreationists don't see impacts that managers do (Knudson and Curry 1981), and managers likely don't see impacts to natural processes that ecologists do. Finally, trained ecologists often can't see critical flows of energy through natural systems, or blockages to energy flows. Often sensitive instruments are required.

Finally, while wilderness ecological research must focus on applied problems that concern managers, such research, driven as it is by managers' perceptions, can and has missed problems that are most basic and vital to the very health and existence of wilderness. Acid precipitation represents one such example. As I understand it, the problem of acid deposition has been with us for years; managers just weren't aware of it. If they were aware of it, the impact of the problem seemed so distant or so out of the their control, that scarce research resources were not allocated to its study. Yet today we are faced with lakes devoid of fish, an ecological problem that seems to me to be far more serious to ecosystem health and diversity than ground cover loss at campsites or trail erosion, and certainly more serious than lakes that look more turbid after a summer shower.

Study the Impacts of All Uses of Wilderness

Lucas (1987), a pioneering wilderness social scientist, has recently stated that much greater research is needed now on the impacts of recreationists upon the wilderness environment. As a social scientist who cares about wilderness, I support his contention. I have over the years developed educational messages to protect wilderness experiences and environments (e.g., see Roggenbuck and Berrier 1982). In the early 1980s my graduate students and I developed educational interventions and successfully dispersed wilderness visitors throughout the backcountry. At the time we were pleased with the success of our applied research. More recent research suggests that we may have been doing more harm than good to the environment; we may have just been spreading out the impact (e.g., see Hammitt and Cole 1987). The recent work of David Cole of the Forest Service and Jeff Marion of the National Park Service have begun to help us better understand the relationships among use and behavior, and frequency, time, and extent of soil and vegetation impacts. We need more of this kind of research to help us social scientists develop the correct messages in our educational programs.

Additional authors have suggested that other wilderness uses have far greater impact upon wilderness than recreation (e.g., Porter 1987), and these remain largely unstudied. For example, the allowable but so-called non-conforming uses like grazing likely have far greater impact upon the environment, including native wildlife, than do recreationists. But grazing has been little studied in wilderness, perhaps because it is a permissible use of wilderness. The Wilderness Act does, however, call for appropriate ***management*** of grazing, and wise management would seem to require a sound information base.

Look Beyond the Wilderness Boundaries

One of the most critical shortcomings of past wilderness research has been its inward focus. While this focus is to be expected, since wilderness research is often funded by dollars allocated to wilderness, many if not most of wilderness problems come from or occur outside wilderness (Krumpe and McLaughlin 1987; Merritt 1987; Porter 1987; Stankey 1987). This problem is typically more severe in small areas, and in areas with irregular or rather linear shapes. These areas are not large enough to buffer such outside wilderness impacts as air pollution, water pollution, and noise of nearby highways, trains, or industry. Also, many wilderness areas are not large enough to provide, the territory or home range of such native species as elk, buffalo, cougars, and grizzly bears. If wilderness researchers and managers are attempting to protect natural systems and their native species, information on how best to do this often lies outside the wilderness. Once problems, causes, and relationships are understood, research needs to help managers develop tools to influence land use planning and management decisions on lands over which they have little direct jurisdiction.

Understand the Ecological Processes and Impacts of Fragile Environments

The USDI Fish and Wildlife Service conducts and coordinates research on threatened and endangered wildlife, including wilderness wildlife. Comparable research needs to be conducted at a systems level on fragile ecosystems (Ranney 1987; Lucas 1987; Howard 1987; Porter 1987), many of which might be considered threatened or endangered in a wilderness context. Most wilderness research,

especially most wilderness recreation research, has been carried out in the Northern Rockies, California, or the Boundary Waters Canoe Area. Little **research has been completed in desert landscapes. Yet desert systems are among our most fragile, and they are also slow to heal once damaged.**

Test Methods of Site Rehabilitation

In the past one method commonly used to rehabilitate damaged sites such as wilderness campsites devoid of vegetation was to close the site. However, more recent research has suggested that in many ecosystems, at least in the West, rest periods would have to extend to decades or even centuries. This is the case even if it were possible to keep all use off the sites (Hammitt and Cole 1987). Since site impacts occur quickly under conditions of light use, and revegetation occurs slowly, the manager using the rest-rotation system would have to keep a large number of sites closed for every open site. In most ecosystems the wilderness manager must assist in the rehabilitation process, but what system of intervention through application of fertilizer, water, seeding, or transplanting is appropriate and effective is largely unknown (Burford 1987; Porter 1987). Effectiveness likely differs by ecosystem, and a comprehensive system of testing rehabilitation across all settings seems necessary. Also, as pointed out earlier, impacts from nonrecreational wilderness uses are often greater than recreational impacts, and techniques for rehabilitating such areas as overgrazed pastures are also needed.

Determine Use-Behavior-Site-Impact Relationships Necessary to Support LAC (Limits of Acceptable Change) Management

The LAC management framework is currently viewed as a major breakthrough in wilderness management and as an example of research helping managers (Lucas 1987). It is often regarded as a solution to the complexity and malaise of past carrying capacity research problems, and it is being widely adopted by wilderness management agencies. In actual fact, the LAC seems to me to be only a slight re-statement and major side-stepping of the carrying capacity question. The LAC is valued because it identifies conditions to be maintained, and desired conditions are largely prescriptive. Thus, LAC research has focused on defining both salient indicators of desired social and natural conditions in wilderness and acceptable standards for each indicator. If and when standards for conditions are established, and if and when monitoring of conditions is carried out, then instances where conditions do not meet standards will be found. When that time comes, the manager is back to the **age-old carrying capacity questions: how do amount of use, time of use, type of use, and behavior of user relate to the undesirable impact. These questions require further research.**

Identify the Learning, Especially the Land Ethics, Values of Wilderness Use

Wilderness land ethic learning logically falls under the need described above to understand all the benefits of wilderness. However, wilderness philosophers like Leopold (1949), wilderness ecologists (Franklin 1987), and wilderness managers (Plenert 1987) have all noted the unique value of wilderness as a context for developing understanding, sensitivity, and commitment to land protection. Thus, I believe land ethic deserves special consideration here. Little or no research has explored the nature, extent, and process of this potential wilderness effect. Researchers have studied the self concept improvement and skill development benefits of wilderness programs like Outward Bound and the National Outdoor Leadership School (Driver and others 1987), and the short-term learning of specific behaviors in response to educational messages in wilderness (e.g., see Krumpe and Brown 1982; Roggenbuck and Berrier 1982). None of these have, however, assessed the broader value and commitment changes required for a change in ethics. I see -- as did Leopold -- the development of a sensitive land ethic as potentially the greatest value of wilderness for individuals, society, and spaceship earth. When we understand if and how this happens in wilderness, and if we as researchers and managers can nurture this process, then we will have taken our greatest step toward solving and reducing threats to wilderness from inside and outside the wilderness.

STATING THE RESEARCH QUESTION

After we have decided upon what wilderness topics to research, I believe that we in the past have sometimes erred in how we have stated and approached the research question. I believe our problems in this area could be summarized as three: defining the research question too narrowly, failure to take an interdisciplinary approach, and paying too little attention to context.

Consider the Big Picture

Leopold (1949) in his early essays about ecology and land health emphasized the interconnectedness of all components of healthy ecosystems. Later, human ecologists have noted the interdependency of humans with their social, biological, and physical environments. No where are these connections more

clear than in wilderness; indeed, the existence of all appropriate component parts and the natural flow of energy through them define an ecosystem as wilderness. This suggests that wilderness research should take a holistic approach (Pritchard 1987). We must not lose track of the big picture; we must not fail to identify threats to ***linkages*** within wilderness systems by our narrow focus on specific problems. Examples of this problem in the past might be my own research referenced earlier whereby I used educational interventions to disperse use to enhance solitude experiences, but in the process I may have increased the area1 extent of landscape impacts. Recent fire research indicates the need to study the broad landscape mosaic to understand the natural role of fire, rather than focusing on individual forest communities (Kilgore 1987). In our studies of the human element of the wilderness system, we have tended to survey only wilderness visitors. In so doing, we not only miss the vicarious wilderness user, but we fail to gain an understanding of broad societal trends, like the growth in numbers of minority groups or the aging of the population, which will likely have pervasive impacts on the size, kind, and quality of the National Wilderness Preservation System.

Take an Interdisciplinary Approach

Related to the need to consider the big picture is the need to take an interdisciplinary approach to the study of wilderness problems. Researchers almost by definition are specialists; we each have our own disciplinary homes, e.g., biology, psychology, sociology, or history. Within our respective disciplines, we each have our own preferred theories to approach the study of problems. The end result is that we each bring a unique research perspective, and we tend to approach all wilderness problems from that perspective. The problem is that issues of concern to wilderness managers almost always have multiple dimensions, requiring different theoretical and conceptual perspectives. For example, I came to this conference thinking that I as a social scientist had little or no role to play in studying the impacts of wilderness grazing. That seemed to be the jurisdiction of plant and animal ecologists. However, Keith Corrigall of the Bureau of Land Management noted here that the grazing issue was largely one of a way of life -- a traditional and valued way for family farmers to make a living. Suddenly, there is a need for a social scientist to be on the wilderness grazing study team. I would also add that, given the importance of wilderness in defining the American culture -- in defining who we are as a nation, we should include the humanities and the arts in our study of many wilderness problems. The contribution that Roderick Nash, a historian, has made to the field of wilderness management supports my contention (e.g., see Nash 1982).

The Context is All Important

One of the important principles of psychology and social psychology is that humans ***process*** stimuli that bombard them. They aren't simple robots that respond the same to the same stimuli across all situations. Instead, they filter and shape informational inputs, and how this is done is to a large degree shaped by the ***context*** of the situation. We get different answers to the same research question depending on the context. The same is apparently true from a slightly different perspective in the case of ecological research. For example, what is natural or unnatural depends in part upon the frame of reference used.

As examples, the National Park Service and the USDA Forest Service are currently studying the impacts of aircraft flights over wilderness upon visitor experiences. As I understand it, engineering firms plan to provide answers to this question through acoustical lab work, where levels and types of sound can be carefully controlled and human response carefully measured. The firms are also drawing upon airport-community noise research findings. I believe these studies and research designs have little ecological validity in wilderness. Sound is likely perceived and judged differently in the context of wilderness.

Environmental ***scale*** is critically important in basic research on defining naturalness in wilderness (Franklin 1987). Four different perspectives might be taken: the individual, the species, the community, and the landscape. In the case of wilderness, it is probably wise to study the broad (landscape or community) processes, but the point here is that we get different answers depending on the micro versus micro-scale of our perspective. Fire ecology research illustrates this principle well.

The ***temporal*** context is also very important. By the nature of wilderness research funding processes, almost all of our research is a one-time snapshot look at an issue. This causes serious problems for the social scientist, and severe problems for ecological research. These one-time, short-term studies typically don't permit us to study process, and if we can't study process, we can't understand cause and effect. We can't understand trends of wilderness use and users. We can little study how it is that visitors developed enhanced self concepts or a land ethic during wilderness visits. In ecological studies, process is what defines degree of naturalness. What appears natural in the short term might be unnatural in the long-term, and vice versa.

Short-term studies fail to tell us what perturbations in the environment are natural and which ones aren't (Franklin 1987; Hill 1987). For example, data across decades or centuries are likely necessary for us to know whether the apparent recent global warming is a natural short-term event or an unnatural long-term crisis.

CONDUCTING THE RESEARCH

Lucas (1987) has provided an excellent review of the evolution of wilderness research processes from the early 1960s to the present. He notes that in the early years wilderness research was primarily descriptive, simplistic, lacking in theory, uncoordinated across individuals and time, and largely one-shot case studies. He points to considerable improvement on these matters in the late 1970s and 1980s, but also notes a reduction in the amount of wilderness research in the 1980s. My own concerns about the way wilderness research is carried out at this time include a frequent lack of theoretical foundations, failure to include the appropriate academic disciplines, lack of studies across time, failure to do cause and effect studies, and failure to study behavior.

Need For Theory-Based Research

Several characteristics of wilderness and wilderness research favor addressing problems from a descriptive in contrast to a theoretical context. Wilderness management problems are typically defined by managers or by users, and thus tend to be of a very applied nature. Second, problems are often perceived as reaching crisis conditions, and quick answers are needed. Third, research funds are typically in short supply and provided for short periods of time. Fourth, while wilderness problems usually cross disciplinary lines of scientific inquiry, there is usually insufficient time and money to assemble an interdisciplinary team -- each member having a strong theoretical base in his or her discipline. Instead, wilderness researchers such as myself quickly learn to address a variety of research questions, and quickly are seen as a jack-of-all trades. That process provides us with lots of stimulating work; it does not lead to strong theory-based research.

What is the value of theory-based research? Let me begin by saying there is some value in having us applied psychologists, sociologists, and ecologists in natural resource and forestry departments and agencies conducting wilderness research. We understand the holistic nature of wilderness systems and the management structure and frameworks better than do our colleagues in the more basic disciplines. However, theory rests on a body of learning of long-term and credible standing, and can help us researchers ask the managers' questions in the right way, gather the right data, look for appropriate relationships, interpret our findings more meaningfully, and help us draw conclusions with more confidence. At this stage of wilderness research, in most areas of inquiry, we are remiss if we don't stand on a body of theory in our research.

Let me give you an example of the point I'm trying to make that came home clearly to me at this conference. One of our first speakers, Craig Allin, a political scientist, gave us an excellent paper on the relative roles and power of the agencies versus Congress in managing wilderness in the 21st century. In doing this he reviewed the 136 wilderness statutes that have been passed by Congress since the 1964 Wilderness Act. From this, *and* drawing upon political science theory, he was able to identify distinct shifts and periods of Congressional involvement in wilderness management during this time period, give reasons for Congressional action, and make educated guesses about the likely role of Congress in the future. It happens that I too in the mid-1980s reviewed all the wilderness statutes (Browning and others 1988) and looked for key laws that might give new management direction. I found many of the same important laws that Craig Allin did, but because I am not a political theorist, I failed to see the "whys" and the "bigger picture" of Congressional action. Because of a lack of theory, I was ill equipped to speculate about the future.

Involve the Right Academic Disciplines

My example of Craig Allin's review of wilderness law supports my next recommendation for conducting wilderness research: choose individuals with the right disciplinary base to answer the question. A trained political scientist will likely be able to understand and interpret the "why" and "wherefores" of wilderness law better than a forester who has had one course in wilderness policy. (Of course, it would be even better to have the forester and the political scientist work together on the problem). In the case of the aircraft overflight study mentioned earlier, the Park Service and Forest Service would be wise to have environmental psychologists work with the engineers to assess and evaluate response of wilderness users to aircraft noise. Environmental psychologists have a large body of theory that relates to affective appraisals of natural environments.

Do Studies **Across Time**

I have already mentioned the past tendency for wilderness research to be one-time, one-shot case studies, and the need for wilderness researchers to study process. I said then, and emphasize again, the need for continuous, long-term studies. The reason for this in basic ecological studies is obvious. If wilderness is to be a natural baseline or benchmark against which we can assess and evaluate our altered environment, we must know what wilderness naturalness is. Wilderness systems are not static; they are dynamic. We need to understand these natural rhythms of change.

David Cole's work on campsite impacts (e.g., Hammitt and Cole 1987) demonstrates the practical utility of wilderness studies across time. He and others (e.g., see Marion and Merriam 1985) were able to study change in such campsite conditions as amount of vegetative ground cover, size of impacted area, and extent of soil erosion in a temporal context. They found that many campsite impacts occur quickly under conditions of light use, and that meadows were often more resistant and resilient to impact than forbs on the forest floor. These findings completely changed the messages we give or should give to wilderness enthusiasts about ways to minimize their impacts.

Finally, in our survey research about wilderness experiences, we usually measure the nature of the experience in mailback questionnaires after the trip. Sometimes we interview respondents as they leave the wilderness. In rare instances we measure person variables immediately before and immediately after the wilderness visit. If we want to know the long-term benefits of wilderness for the human spirit, then we need to study individuals long after they have left the wilderness. If we are going to understand the process by which the individual attained benefits in wilderness, then we need to study the individual across time within wilderness. Only by studying the ebb and flow of the experience within wilderness will we be able to understand the role of the wilderness environment versus companions in prompting wilderness benefits, or the influence of length of stay in permitting the silence of wilderness to heal the stressed psyche.

Do Field Experiments in Wilderness

Most past wilderness research, at least research on the nature of the wilderness experience or recreational impacts, has been descriptive or correlational in nature. We know little about cause and effect, about what really causes people to judge the wilderness the way they do. We don't know what causes people to move to a different zone or campsite in wilderness -- or to drop out of the wilderness completely. This leads to my recommendation that we do experiments in wilderness.

Some individuals (e.g., Stankey 1987) have opposed such research designs in wilderness, indicating that the experimental process involves manipulation by man, and that violates the meaning of wilderness. Others have assumed that experimentation necessarily involves instrumentation -- gadgets that are obvious examples of technological man. I certainly share the concerns of these individuals, and deplore the collars that black bears in the wilderness of Shenandoah National wear in the name of science. (I wonder if the National Park Service would allow me to put collars on wilderness hikers to permit assessment of changes in the human psyche as individuals move through the wilderness experience.) Nevertheless, I believe that wilderness managers are frequently doing field experiments in wilderness, or involving wilderness, and these natural experiments could and should be studied. For example, we can study knowledge, attitude, and behavior response of wilderness visitors to presence or absence of educational literature on trailhead bulletin boards. We can study change in campsite selection behavior of recreationists as wilderness campsites are administratively closed or opened. These kinds of "natural experiments" can afford freedom of choice for the visitor but enough control for the experimenter to begin to assess causal relationships.

Study Wilderness Behavior

Ecologists have long studied the behavior of creatures of the wilderness (I assume that is why the black bears in Shenandoah wear collars.) For some reason, we social scientists have been reluctant to study human behavior. Perhaps we worry about invasion of privacy in wilderness (we apparently don't worry about the bear's privacy.) Perhaps we worry that studying human behavior in remote wilderness is too difficult (that doesn't seem to bother wildlife biologists). Perhaps we haven't studied human behavior because wilderness is largely perceived as a "state of mind" (Nash 1982). I agree that wilderness is largely perceptual, and we must study "states of mind." Yet it is behavior that impacts on the wilderness environment, and behavior has large effects on wilderness experiences. Such behavioral responses as displacement are important indicators of serious wilderness management problems.

We do need to have sensitivity about what behaviors we study and where in wilderness; spying on people's activity in the wilderness campsite might be

as inappropriate as putting collars on black bears. I believe, however, that many behaviors in wilderness can and should be studied to permit us to assess and evaluate the success of management practices. The Heberlein and Dunwiddie (1979) observational study of visitor behavior in the Bridger Wilderness permitted us to better understand the relationship between use levels and campsite selection. Roggenbuck and Berrier (1982) observed campsite selection in Shining Rock Wilderness and found that people did change their behavior in response to trailhead information.

CONCLUSION

To this point I have described some of the pitfalls of past wilderness research. In so doing I have also suggested potential solutions. In the remainder of my paper I will summarize my wilderness research recommendations and briefly suggest actions that might be taken to implement my recommendations.

Summary of Recommendations

To provide the greatest benefits to individuals, society, and spaceship earth, wilderness research should be organized and funded to:

1. Identify all the values of wilderness
2. Identify the vicarious values of wilderness
3. Focus on the basic ecological values of wilderness
4. Study the impacts of all uses of wilderness
5. Look beyond the wilderness boundaries
6. Understand the ecological processes and impacts of fragile environments
7. Test methods of site rehabilitation
8. Determine the use-behavior-site-impact relationships necessary to support LAC management
9. Identify the learning, especially the land ethic, values of wilderness use.

To accomplish the above goals, wilderness research must:

1. Consider the big picture
2. Take an interdisciplinary approach
3. Emphasize the context
4. Do theory-based research
5. Involve the right academic disciplines
6. Do studies across time
7. Do field experiments in wilderness
8. Study wilderness behavior

Implementing Recommendations

The program I have suggested to solve past pitfalls of wilderness research is broad and comprehensive. I am now suggesting seven specific actions which might be taken to implement the program. Some of these actions will require increases in funding, but others involve simple changes in the focus of existing programs.

Increase funding. Wilderness research funding has decreased over the last decade. Lucas (1987) estimated that the federal agencies annually spent about $.09 (1982 dollars) per acre of wilderness on wilderness research in the late 1960s. In 1985, that amount had decreased to about $.01 per acre. At the same time commercial timberland research amounted to $.50 or more per acre. Like Lucas, I believe that the task of protecting and managing wilderness is at least as complex as growing and managing commercial timber. After all, wilderness management involves far more diverse values, e.g., natural processes, wildlife, threatened and endangered species, air and water quality, grazing, primitive and unconfined recreation, and solitude. Also, the information base for management of wilderness is far smaller than it is for producing commercial timber, because we only began wilderness research in the late 1960s. Also, the public clamor for wilderness remains high. Most wilderness environments are on public lands, while the most valued timber producing lands -- at least in most regions of the country -- are in private ownership. Finally, wilderness research deserves greater funding because the penalty for error is grave. It takes much longer to grow wilderness than it does to grow trees.

The wilderness research community must also act to help itself in the funding arena (Stankey 1987). At this time the public likely knows or cares little about the findings and value of wilderness research. Yet the findings of much ecological research, e.g., research on grizzly bears, are of great intrinsic interest to wilderness visitors, vicarious users, and the general public. These findings must be marketed on public television, commercial television, and in coffee-table magazines to generate funding and support for additional research.

Assure Continuity in Funding. Wilderness research, especially ecological research, needs the promise of continuity of funding across time to permit long-term studies of environmental processes. The present fiscal-year nature of federal funding hampers long-term commitment of resources. I recommend three actions. First, agency administrators should be more willing to risk approval and commitment of long-term projects, when there are only funds for Phase 1. We university cooperators realize the funding constraints of the agencies, but we are willing to commit our

resources to a long project, ***provided we know*** that our project is high on the list to be funded into Phase 2 and beyond. Second, I believe that wilderness research should benefit from some sort of a levy on wilderness use and users. Such a levy may be an excise tax on backpacking equipment, but it also may be a fee on grazing and other commodity uses of the wilderness. Finally, we should explore the potential of non-profit organizations "buying" into wilderness research in a manner similar to the Nature Conservancy buying threatened landscapes. This would be especially useful in permitting the continuity of long-term research during lean years of federal funding.

Publish and Share Research Findings. Much wilderness research is carried out, but findings do not receive widespread exposure among managers, other researchers, user groups, or the general public. For example, I recently read with amazement and disbelief that the National Park Service apparently does more research in wilderness and about wilderness than does the Forest Service (Butler and Roberts 1985). National Park Service research tends to be heavily oriented toward ecological studies, and this might explain my lack of knowledge of that work. However, the National Park Service does not have its own research publication outlet, and its research publication record is probably much less and far more scattered than is the Forest Service's. As a university professor, I find the bulk of my class material comes from the Forest Service research publication series. We need the same from the National Park Service.

Coordinate Among Wilderness Managers and Researchers. Calling for greater coordination between management and research is a common and inexpensive call to solve research problems, and I won't dwell on it much here. It is obvious that if researchers and managers both understand each other, more research will be accomplished, addressing the right questions, and there will be fewer disappointments. However, in wilderness there is the additional concern among managers that the research can be a nonconforming uses of wilderness. This has apparently led to conflict, with researchers making the case that their work has far greater societal and environmental value than recreation, and causes far less impact than recreationists and cows (Franklin 1987). I agree with Stankey (1987) that we need guidelines developed by wilderness administrators and involving researchers, user groups, and the public on the nature of research that is appropriate to wilderness and on the kind of data collection instrumentation that is permissible. In general, I believe that sensitivity by scientists on the meaning and the broad societal values of wilderness and an ethic to use the minimum tool possible to collect research data would go a long way to lessening this problem.

Fund Cooperative, University Research, Especially Graduate Student Research. I make this recommendation because I see it as the best way to accomplish holistic, interdisciplinary research of the type described earlier in this paper. (As a university professor with graduate students, I hope I'm not just trying to feather my own nest). I am concerned about this because I have heard agency research administrators state intentions of hiring short-term research technicians to accomplish data collection, and having in-house research scientists analyze and publish the results. The wilderness research units with the federal agencies do not have a team of Ph.D. ecologists, psychologists, sociologists, historians, and political scientists on their staffs, at least not the ones that I know of. Thus, I believe their work will tend to lack the breadth and creativity that results from a team of people from a variety of disciplines working together. We university scientists are often accused of working alone, and not learning from our colleagues across the hall or across campus. For some of us, this is undoubtedly true. However, there is a real advantage of funding research when graduate students help conceptualize the project, collect the data, and prepare project reports and manuscripts. These students take courses across campus; they are exposed to the latest theories of a variety of fields related to wilderness. Also, professors from other departments are on their thesis committees. If their thesis is part of an agency funded project, that project gains the intellectual expertise of professors from other disciplines at no cost whatsoever to the agency sponsor. Finally, entry standards into graduate school and required qualifications for research assistantships each year become more rigorous. Graduate students in wilderness research programs are extremely intelligent, highly dedicated, and they help us professors keep abreast of the latest theory and research in related disciplines.

Support Research to Solve Problems Outside Wilderness. As stated earlier, many wilderness management problems arise outside of wilderness. If these problems are solved, then many wilderness protection problems would disappear. Each of us has a responsibility to act to reduce these problems of air pollution, acid deposition, and water pollution. We can help accomplish this by changing our own consumptive behaviors, joining appropriate groups that seek to change the behavior of other consumers, joining political action groups that lobby for appropriate changes in environmental policy, and by

working within our own agencies and organizations to shape the priorities of research funding. Sometimes these actions mean giving up a product or a behavior that we enjoy. It might mean giving up some dollars for a wilderness research cause that is greater than our own area of research expertise.

As a Last Resort, Amend the Wilderness Act to Mandate Science and Research as a Value of Wilderness. In the introduction of this paper I indicated that the Wilderness Act *implies* that science is an appropriate value of wilderness, and that research seems necessary to meet the management mandates of the law. In the body of the paper I have laid out wilderness research needs and guidelines for conducting the research. In the conclusion I have recommended actions to implement a research program. If these or other actions are not taken to increase and improve our wilderness research program, then as a last resort, I recommend that appropriate advocacy groups be mobilized to amend the Wilderness Act to more clearly mandate the values of wilderness for science. I hesitate to make this recommendation, because the Wilderness Act has to this point served society and wildlands well. Also, I see continued growth in commitment and sensitivity among wilderness managers across the four federal agencies. Still, there is too much at stake for the wilderness resource and wilderness research to be neglected (Lucas 1987). If drastic actions are necessary, I recommend taking them.

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WILDERNESS MANAGEMENT TRAINING RECOMMENDATIONS

Paul D. **Weingart***

ABSTRACT

Wilderness management training in the past has been sporadic and dependent primarily on Regional or State offices of agencies, and in many cases on dedicated individuals within agencies. Training is improving but a national interagency, interdisciplinary task force is called for to assess training needs for the future, provide consistency, and reduce duplication. The task force should include non-agency participants, including the academic community, and focus on all levels of wilderness management training needs.

In order to recommend for the future, we need to briefly review the past, review the successes, identify those areas where we could have done better, and utilize that experience to build a strong program for the future. In some areas of wilderness management training, we have done well, but we have a long way to go to achieve the management excellence wilderness deserves.

Before reviewing the past, I'm going to take the liberty of making two assumptions that I'm sure most of the people in this room will agree with. The first assumption is that wilderness is a resource, equivalent in stature to any of the other resources the four agencies (U.S. Forest Service, Bureau of Land Management, National Park Service, and U.S. Fish & Wildlife Service) have the responsibility of managing. We know not all managers agree with that, nor do all of Congress or all of the Administration. Therefore, one of our continual challenges is to see that wilderness is given equal consideration in allocation of financial resources for its management. An analysis of past legislation treating wilderness clearly indicates the intent of Congress to recognize wilderness as a resource.

Another assumption I will make is that we're primarily concerned with management training **for** wilderness, not **in** wilderness. For clarification -- our focus should be caring for the wilderness resource first, rather than being primarily concerned about providing people a setting to achieve their desired experiences. This opportunity may be provided through proper management of the wilderness resource, but it should be secondary to the primary concern for wilderness.

In *some areas of wilderness management training, we have done well, but we have a long way to go to achieve the management excellence wilderness deserves.*

Now let us reflect on the past. In 1964, '65, and '66, the Pacific Northwest Region of the Forest Service conducted wilderness workshops in the Eagle Cap Wilderness, the Mt. Jefferson Primitive Area, and the Glacier Peak Wilderness, respectively. Those workshops were intended to bring managers up to speed regarding implementation of the new Wilderness Act of 1964. The participants covered the spectrum of management responsibilities, from Regional Office to Ranger District, plus research. Two people many of us know were participants in those early schools. They were Jim **Overbay,** Deputy Chief of the Forest Service, and John **Hendee,** now a Dean at the University of Idaho. Regardless of the success of the workshops, they were discontinued because of a perception that they were too expensive and an underlying feeling that the participants were having too much **fun.**

To my knowledge, the end of the Pacific Northwest Region Wilderness Management Workshops led to a long period of inactivity of field oriented wilderness

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training. I'm sure a dedicated ranger or maybe a Forest Supervisor did training in wilderness on their unit, but there was little in the way of a regional effort in this regard.

In the 1970s and into the 1980s, many wilderness workshops, seminars, and symposiums were conducted, but primarily in the atmosphere of the style of the "Holiday Inn" meeting room or university conference center.

In 1983, a regional wilderness workshop within a wilderness was again conducted. It was by the Southwest Region of the Forest Service. The workshops have been conducted every year since and are programmed in 1990, as well. These workshops included participants from the Bureau of Land Management, the National Park Service, and the public interest sector, as well as the Forest Service.

In the mid-1980s, national workshops were held in locations close to wilderness such as the workshops at Portal, Arizona adjacent to the Chiricahua Wilderness. All agencies participated in that workshop.

Let's learn from the past to chart a better course for the future. We don't have the luxury to each do our own thing.

The Bureau of Land Management has made a national assessment of their wilderness management training needs and are even utilizing the National Outdoor Leadership School in their training cadre for a low impact course for arid environments.

In May of 1990, the Forest Service will conduct the first "Advanced Wilderness Management for Line Officer Training Session" at Nine Mile near Missoula, Montana. That will be a national meeting involving the Chief's Office, Regional Foresters, Forest Supervisors, Regional Staff Directors, and representatives form other agencies and groups at equivalent management levels.

Other training efforts are being pursued by most other agencies. One of the most notable efforts is the Interagency Wilderness Management correspondence study course headed by Dave Porter at Colorado State University. This is supported by the BLM, USFS, NPS, and CSU.

As you can see, the efforts over the years have been sporadic, usually single agency oriented, and, to a great extent, left to the discretion of the Regional or State offices of the respective agencies. This is changing somewhat, as evidenced by some of the examples given, such as the correspondence course and the Nine Mile session in Montana.

With that overview of wilderness management training, where do we need to focus to properly train the managers for the future?

On October 4-6, 1983, the First National Wilderness Management Workshop was conducted at Moscow, Idaho. The theme of the workshop was "Taking Care of What We Got." Nearly 400 participants from all parts of the country gave their input thorough seminars and working group sessions. All wilderness management agencies, research, academia, interest groups, and interested members of the general public were represented. As a consequence of the workshop, a steering committee was established. They prepared a Five Year Wilderness Management Action Program. There were five issues identified, which encompassed 23 recommended actions. The five issues were:

1. Educating the public
2. Education and training of managers
3. Capacity and concentrated use
4. Interagency coordination and consistency
5. Wilderness management practices

Two of these issues are especially relevant to our conference this week. They are #2 -- Education and training of managers and #4 -- Interagency coordination and consistency.

Let's take a look at the recommended actions relative to these two issues and see if they still apply today.

Under 'Education and Training of Managers" the recommended actions are:

a) Institute and revitalize comprehensive in-service wilderness management training, focusing on the value of the wilderness resource, wilderness ethics, and low-impact camping, utilizing both agency and non-agency expertise.

b) Conduct workshops and other programs, nationally, regionally and locally, as cooperative ventures of agencies, educational institutions, and

interest groups in order to share ideas, concerns, and techniques relating to wilderness management.

c) Include wilderness management as a course in university natural resource curricula. Establish a basic course on wilderness as a resource, including management of visitors. Encourage accrediting groups (like the Society of American Foresters) to include it in their curricula requirements.

d) Each agency should systematically identify management personnel who would benefit from additional training in wilderness management.

Under "Interagency Coordination and Consistency," the recommended actions are:

a) Wherever possibilities exist, develop joint plans for wilderness units crossing administrative boundaries, whether intraagency (as with adjoining National Forests) or interagency (e.g., adjoining National Park Service, Forest Service, or BLM units); adjust administrative boundaries, where feasible, to promote consistency and reduce management costs.

b) Continue to develop and improve inter-agency wilderness management training programs.

c) Coordinate communication among agencies on wilderness management.

d) At the end of five years, convene a task force to review implementation of the Management Action Program.

In conclusion of the five year Wilderness Management Action Program, the steering committee re-emphasized the last recommended action by stating: "At the end of five years, a task force should convene, evaluate what has been accomplished, and set new priority guidelines."

The five year period recommended for review passed us by in October of 1988.

My major recommendation today is that we waste no time before forming an interagency, interdisciplinary task force, including non-agency participants, to make a comprehensive assessment of where we should be going in wilderness management training for the future. The task force should focus on the following:

1. Development of a sound basic wilderness philosophy in all managers.

2. Develop a national training strategy for all levels of management, including all management agencies, research, and academia. Consistency in management and cost savings through more coordinated and focused training programs would be the primary objective of this proposal.

3. Nonrecreation uses should be emphasized in management training to give them proper balance with recreation use of wilderness.

4. The use of a multi-disciplined training cadre for wilderness management training should be considered.

5. Development of international exchange of management training expertise for the benefit of the global resource of wilderness should be evaluated.

In summation, let's learn from the past to chart a better course for the future. We don't have the luxury to each do our own thing. Although the four federal agencies directly involved in administration of wilderness have legislatively been assigned different missions, the Wilderness Act of 1964 generally brings them together under one National Wilderness Preservation System, established by Congress. We need to work together as a team to properly pursue the best management for that precious resource of wilderness.

THE ROLES AND RESPONSIBILITIES OF HIGHER EDUCATION IN WILDERNESS MANAGEMENT

Stephen F. McCool

Traditionally, higher education has been viewed as having three primary responsibilities: teaching, research, and service. While we can all agree that higher education does have these roles in wilderness management, I think it is more useful to think specifically about how higher education can anticipate and respond to the wilderness management challenges of the current and next century.

Higher education has had a significant impact on wilderness and wilderness management. For example, academic settings have frequently served as the backdrop for debate over the roles, functions, and benefits of wilderness in our society. Higher education has been deeply concerned about the social, psychological and ecological values of wilderness. Universities and colleges have obviously been the source of natural resource managers who currently administer the National Wilderness Preservation System. And university researchers have played a pivotal role in advancing our understanding of the natural processes that freely operate in wilderness settings, as well as furthering our knowledge about the characteristics, motivations, and expectations of wilderness visitors.

It is important to consider higher education an important and essential partner in enhancing the quality of wilderness management in the future. The academic setting is designed to allow people the freedom to explore, test, and debate ideas that may prove too costly or controversial for the so-called "real world." Academia provides the environment for healthy discussion of concepts that managers may steer away from for whatever reason. Academia also allows people to test techniques and approaches that may eventually have some utility for management, but which need a laboratory setting prior to field testing and implementation.

Finally, academia frequently provides management with inexpensive help in managing wilderness or evaluating management programs through the use of students, volunteers, and faculty expertise. Not only is this help inexpensive, but it is often the source of informal, outside feedback about techniques and solutions to management problems.

Given the important values of higher education, what specific roles and responsibilities does it have in wilderness management?

It is important to consider higher education an important and essential partner in enhancing the quality of wilderness management in the future.

First, it is widely recognized (for example see Krumpe and McLaughlin 1987) that the public should be educated about wilderness and appropriate wilderness recreation skills. Higher education is a component of this process for two reasons: (1) wilderness plays an important role in 'American history and culture, and understanding this role is part of becoming an educated person; and (2) many students eventually become wilderness recreationists.

Higher education is an important reservoir for teaching environmental and wilderness ethics and skills. Many colleges and universities have outdoor recreation programs that provide students the opportunity to learn how to camp, hike, raft, kayak, and ride in wilderness areas. What they learn in these settings may influence the types and intensities of impacts managers must deal with in the future. A spin-off of these programs is a skill in instruction that managing agencies should investigate. Instructors in these courses could work with agencies to help them more effectively communicate with their clientele about wilderness recreation skills needed to reduce impacts.

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Most colleges also offer academic courses in the environment. These courses not only include ones in the biological sciences, but they frequently involve courses relating wilderness to the broader social milieu. Many like the University of Montana, offer courses in environmental ethics. These courses expose students to the culturally important ways of viewing and evaluating natural environments and processes, and frequently imbue class participants with a sense of what is right. Environmental ethics courses often expose students to such important writers as Leopold, Marshall, Thoreau, Carhart and, Emerson.

In a field like wilderness management, where the knowledge base and the character of the product of management are changing rapidly, continuing education is essential for effective and efficient management.

Second, colleges and universities have a function in documenting the history of wilderness and wilderness management, and of archiving important documents. These responsibilities include teaching and research in the history of wilderness and wilderness management and serving as an archive of materials concerning these topics. Historians have much to offer our society in developing an understanding of how the wilderness concept has evolved and how we, as a society, have responded to the wilderness concept. University libraries are also excellent places to store and archive materials concerning wilderness and wilderness management.

Third, higher education has an important role in professional education for wilderness management. Higher education is the source of new recruits into the larger field of natural resources management. To some extent, higher education must take the credit or blame for the current status of wilderness management. Unfortunately, although we have made significant progress in managing wilderness during the last twenty-five years (McCool and Lucas 1990), I am deeply concerned about our ability to effectively manage wilderness into the 21st century using the professional educational curricula we have depended on in the past.

Those of us in higher education need to work with wilderness management agencies to identify the needed skills, knowledge, and abilities to efficiently manage wilderness. Current undergraduate programs in natural resource management tend to emphasize extraction of material or tangible goods and services and the taming of natural processes for production purposes. Wilderness management involves minimizing human influences on natural processes and managing wilderness for intangible but nevertheless important values. On the other hand, much of the concern about wilderness management issues comes from faculty in wildland recreation management programs. While this interest has historically reflected many of the management problems confronting wilderness, one can only wonder, particularly given the theme of this conference, about the continued appropriateness of recreation programs as the dominant influence in wilderness management education.

We need to think in terms of developing professional bachelor's level programs in wilderness management. This is a need that several individuals have spoken of before; I think it is time we seriously consider establishing a few programs in wilderness management. We need to examine the knowledge, skills, and abilities needed to efficiently and effectively manage wilderness. I believe that a bachelor's program would be a broadly based program that would deal with the cultural and historical evolution of wilderness in America, that would examine the literature of wilderness, but would also develop competence in understanding ecological processes and how to work with them. It would provide students with the opportunities to gain greater appreciation for the recreational and non-recreational values of wilderness and how to protect them.

Fourth, higher education has a role in continuing education of wilderness managers. I differentiate between continuing education and in-service training. In-service training deals with managing agency procedures, manuals, and skills. Continuing education would focus on broad concepts, principles, and theories that are developing in the field that, when used, increase the performance level of managers. In a field like wilderness management, where the knowledge base and the character of the product of management are changing rapidly, continuing education is essential for effective and efficient management.

Krumpe and McLaughlin (1987) noted that as our knowledge base expands, it becomes an "obligation for researchers to translate their findings into understandable facts and concepts for the education of wilderness managers." Other than a couple of correspondence courses, there are currently no formally established continuing education programs in wilderness management, despite the many calls for increased training and education of wilderness managers (McCool 1989a; 1989b; McCool and

Lucas 1990; Spray and Weingart 1989). I again suggest we consider the development of a systematic, comprehensive continuing education program for wilderness managers. This program would help current wilderness managers with little formal education in wilderness management, but it would also keep newer managers up-to-date.

Fifth, those instructing in wilderness management areas can serve as professional reviewers of on-going or new management activities. Such reviewers can provide the agencies with outside expertise and advice in new approaches, review current operations, and give input on proposed management plans and actions. An example of such a review is the landmark Leopold report of 1963 that examined wildlife management in the National Park System.

A sixth role is that of research. While others at this conference have spoken of the need to conduct research to enhance the state-of-the-art of wilderness management, I will repeat this call. Production of new knowledge is one of the most important roles higher education has in our society. I would like to make the point that while the Forest Service has a research branch, there are researchers in university settings that can also provide needed information gathering services. In addition, universities can often provide opportunities for research through cooperative grant-in-aid programs, such as the McIntire-Stennis forestry research program, and they may often be the source of inexpensive researchers, i.e., graduate students looking for thesis projects. Finally, because of the archiving function, universities provide a setting for literature reviews.

Seventh, faculty and staff in university settings can also serve as consultants to wilderness managers for specific problems. In fact, such personnel are probably the best source of consultants at the present time. University faculty, because of their teaching or research assignments, may be aware of tools, techniques, or concepts that may be unknown to managers. Such university faculty may provide managers with fresh ideas or new ways of looking at old problems.

In summary, colleges and universities are significant resources for wilderness managers. While many faculty and students have already made important contributions to wilderness and wilderness management, the new challenges confronting the National Wilderness Preservation System suggest a continuing role for higher education. Managers need to consider colleges and universities as essential partners in the wilderness management task.

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WILDERNESS MANAGEMENT: A TIME FOR COOPERATION

Martin Sorensen*

Effectiveness is the foundation of success -- efficiency is a minimum condition for survival after success has been achieved. Efficiency is concerned with doing things right. Effectiveness is doing the right things."

Peter F. Drucker,
"Management: Tasks, Responsibilities, and Practices," 1973

Managing wilderness resources better for present and future generations is going to require new innovative thinking. Management as usual no longer can be expected to get the job done. Land managing agencies such as the United States Forest Service, the National Park Service, the Fish and Wildlife Service, and the Bureau of Land Management are operating under severe budget and personnel constraints. The expectation is that the constraints will continue. Developing new management visions and goals, including cooperation with conservation organizations, must be identified, discussed, fine-tuned, and implemented. More effective and efficient wilderness management will likely result.

Conservation organizations, major advocates and heavy users of wilderness areas are vast resources of talent and ideas that can be working partners in the management effort.

In 1987, the Sierra Club Board of Directors authorized the formation and funding of the Wilderness Management Subcommittee. The Subcommittee is a component of the Sierra Club's Public Lands Committee. The statement of purpose and goals that currently guide the Subcommittee's work are listed in Figure 1. A notable long-term goal is the development of a partnership with other conservation organizations, land managing agencies, and academia. This partnership would bring together people with a common goal of managing this Nation's priceless wilderness heritage. The partnership would also enlarge the talent pool, thereby creating a larger reservoir of ideas from which more effective management can be fostered. A partnership with bright, aggressive people can produce higher quality thinking and higher quality decisions.

THE WILDERNESS MANAGEMENT SUBCOMMITTEE STATEMENT OF PURPOSE

The primary objective is to protect an enduring resource for wilderness from significant degradation by man's influence and use. To achieve this objective the Subcommittee will actively participate in management planning research, preparing wilderness management plans, and preparing and participating in monitoring the effectiveness of the management plans. In addition, the Subcommittee will prepare and provide educational materials and activities that will help insure the integrity of the wilderness resource for future generations.

Historically, the wilderness movement in America has been focused on enlarging the National Wilderness Preservation System with little or no attention paid to its management. Wilderness resource management has been left almost entirely to the land managing agencies. The assumption has been that the agencies were adequately prepared in terms of commitment, personnel, and budget to manage the resource. Looking back on twenty-six years of wilderness preservation, that assumption is seriously flawed. The result has been that several units in the National Wilderness Preservation System have been damaged. In the Indian Peaks Wilderness

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Figure 1. Sierra Club Wilderness Management Subcommittee statement of purpose and goals (1987).

STATEMENT OF GOALS

Short Term

Establish a cooperative relationship with land managers whose responsibility it is to oversee the wilderness resource.

Become familiar with the statutes establishing wilderness areas, including the 1964 Wilderness Act, paying close attention to any language that deviates from the spirit and intent of the 1964 act.

Become familiar with existing or proposed wilderness management plans.

Establish links with academia, particularly in natural resources.

Develop a wilderness resource management center that will contain as much information as possible related to wilderness management.

Establish and maintain a communications network for the exchange of information.

Formulate proposals to submit to various foundations for income augmentation.

Review the existing Sierra Club Wilderness Management Policy, dated 11-77.

Long Term

- Establish an educational program that will communicate ethics to the public user when in the wilderness. This should be a partnership between land management agencies, conservation organizations, and academia.
- Continued involvement in public forums to insure the Sierra Club's presence in the issues pertaining to wilderness management.
- Provide policy guidance to the Sierra Club Board of Directors
- Periodically review the Subcommittee's effectiveness.

Area west of Boulder, Colorado, vegetation around some campsites and along some segments of trails have been nearly eliminated. The Piney Creek drainage on the western side of the Eagles Nest Wilderness Area north of Vail, Colorado, is severely fissured with unregulated horse traffic. Irregular surface flows of water have resulted. Cache problems abound in numerous wilderness areas in the Rocky Mountain West. Some outfitter camps are canvas hotels. Diminished water quality, vegetation destruction, and impacts on solitude are among the problems that need to be solved. Recreational use is the predominant reason for these problems. However, as non-recreational uses of wilderness are better understood, we may expect to learn of other previously undocumented resource damage. The need to better understand the value of wilderness will see more investigators and researchers venturing into the backcountry, with increased potential for conflicts with recreational users.

Addressing the non-recreational use of wilderness must begin now. The scientific understanding of wilderness has seen a different breed of user in the wilderness. The scientist or researcher will be there to investigate, collect samples, and establish instrumentation sites to further our knowledge of this unique resource. Herein lies a fundamental problem: How are we going to manage our wilderness resource and yet provide the flexibility needed by the researcher to effectively acquire data that will expand our knowledge of wilderness? A few years

ago, as a part of acid deposition data collection, the Environmental Protection Agency sought permission from federal land managers to access target lakes via helicopters. A controversy erupted. Only a few lakes were accessed by helicopters. The rest were reached by outfitter/guide services. An underlying principle of wilderness was involved: The preservation of solitude. Now nearing completion, this acid deposition study will increase our understanding of water resources within wilderness and how we impact those resources by our activities. Just as important are our methods of collection. Managing non-recreational use in wilderness will, of necessity, require creativity.

America's wilderness heritage needs a cooperative relationship a-mong the variety of users to insure its integrity for present and future generations.

The best way to achieve quality wilderness management is through cooperation. The constraints of budget and personnel within the federal land managing agencies are driving the need to find new solutions in wilderness management. Conservation organizations, major advocates and heavy users of wilderness areas, are vast resources of talent and ideas that can be working partners in the management effort. Conservation organizations with their vast networking capabilities in communities around the country can involve the general public in wilderness management programs. Academia can provide cutting-edge concepts in research that expand our view of wilderness. What results is a management triangle. One vertex is the federal land manager; a second vertex is academia; and the third vertex is the conservation community. The triangle is equilateral which means each partner shares equally in the management of wilderness. Cooperative management should be institutionalized through agreements that define the visions, goals, and responsibilities of each partner. The agreements would establish a foundation for continued cooperation for years to come. In addition, the agreements could foster a spirit of commitment and energy in the stewardship of America's wilderness.

A center for wilderness management should be established where concepts, ideas, research, and a library of existing works would be open to individuals or groups involved in wilderness issues. Currently, there is no central resource center available. The center would be funded through foundation grants, tax-deductible donations, and federal dollars. Staffing needs would be determined later. Coordinating wilderness management activities would be a major function of the center. Another function would be to provide educational programs and materials for general use by the public to assist in fostering a more caring attitude about wilderness.

Indeed, the time for cooperation is now. America's wilderness heritage needs a cooperative relationship among the variety of users to insure its integrity for present and future generations. This Nation's wilderness resource, and that of the Earth's as well, is at a crossroads. While recreational use is levelling off in a general sense, the non-recreational side is increasing as we attempt to understand how wilderness can serve as a barometer of human-induced changes to our environment. As a living laboratory, wilderness is unique. It is that uniqueness that we must preserve. Cooperation is the answer.

WILDERNESS MANAGEMENT, ENVIRONMENTAL ETHICS AND THE SAF CODE OF ETHICS

James E. Coufal'

ABSTRACT

Using ***Leopold's land ethic as the basis, cases are made for including a statement on environmentallland ethics in the SAF Code of Ethics, and for wilderness managers to take the lead in promoting this idea. The cases are built upon discussion of codes of ethics in general, a statement on land ethics in particular, and the relationships between wilderness and Leopold's definitions of conservation.***

INTRODUCTION

The Society of American Foresters' (SAF) Code of Ethics should contain an explicit statement on environmental or land ethics. This paper will support this claim by looking at the reasons for codes in general, and for an explicit statement on environmental or land ethics in the SAF Code in particular, making a suggestion for such a statement. It will also provide reasons why the Wilderness Management Working Group of the SAF should take a leadership role in seeking a land ethics statement.

To provide context, an ethic is part of any value system that is used to judge the rightness or wrongness, and the desirability or wisdom of our objectives and actions (Strong and Rosenfield 1981). Aldo Leopold's "land ethic" (Leopold 1966) is the prototype of an environmental ethic, and the terms "environmental" and "land" ethic are used synonymously. A land ethic should, thus, help us to judge the rightness or wrongness and the desirability or wisdom of our objectives and actions related to the land, and in Leopold's view, the "land" includes rocks, soil, water, air, and all the plants and animals of the ecosystem in question. His land ethic was most succinctly put when he said that, "A thing is right when it tends to preserve the integrity, stability, and beauty of the biotic community. It is wrong when it tends otherwise" (Leopold 1966).

In his call for individuals to extend their ethical considerations beyond individual-to-individual and individual-to-societal relationships to the land, Leopold appears to have described "conservation," taken here in its classical sense of "wise use," in at least three ways. Conservation in Leopold's (1966) view is a relationship between man and the land--harmony; an intellectual process (understanding and education); and an action (preservation of the land's capacity for self-renewal). His view is based primarily on the science of ecology, and not so much on religion and sentimentality, which do enter the views of others. These three themes will be returned to in looking at wilderness in relation to the need for a land ethic.

> ***The land, in the Leopoldian definition, is our ultimate (maximum, supreme) colleague, client and boss.***

REASONS FOR PROFESSIONAL CODES

Describing attempts by civil engineering to put a statement on environmental ethics into their professional code, Vesilind (1987) listed three reasons for professional codes in general:

1. To enhance the profession's public image; or to promote public relations.

2. To establish rules of conduct and a system of enforcement of these rules.

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3. To promote the public welfare, especially by placing public good ahead of personal gain.

Earlier, Flanagan (1981) had presented an additional reason:

4. To promote the pride of practitioners, especially professionals, in their occupations.

Codes, Public Image & Professional Pride

Public image and professional pride are important in relation to environmental ethics, so we can begin with what might at first glance appear to be a tangential approach and later return to the main question. When Leopold wrote, nearly 60 years ago, in the Journal of Forestry, it is unlikely that he thought that he would become a prophet of the environmental movement; but so he has (Leopold 1933).

Leopold believed in government incentives, government regulations, and government example on public lands that would provide a role model of proper land management for private landowners, all to the end that the land would be given ethical consideration. But most of all, and very strongly, he believed that a proper human relationship with the land, what he called harmony, would only come about when individuals, both landowners and land users, had made a land ethic part of their value system (Leopold 1966). He believed, in other words, in the stewardship of individuals as being the only real foundation of persons living in harmony with the land. Others have come to believe much the same; Rolston (1986), for example says, "An environmental ethic ought to be incarnated as a way of life." Leopold (1966) thought that government action might be necessary, but not sufficient to this end. And, despite the "environmentalist's" emphasis on his belief that some land needs to be preserved, Leopold also seemed to feel that preservation was necessary but not sufficient to the practice of conservation, and that intensive management could be compatible with the land ethic.

Significantly, what Leopold thought was necessary and what he prophesied so long ago, the belief in an environmental ethic by individuals, might very well be happening at the present. Despite our obvious failures (e.g., one-passenger vehicles, the NIMBY approach (not in my backyard), the RIGM syndrome (Regulate, I've got mine), our reaction to the "end" of the "oil shortage," etc.), there are many signs that environmentalism is becoming an accepted and highly regarded value, and that forests are receiving increasing attention. Shands (1988) believes, for example, that public concern with below-cost sales on National Forests is, "the recent manifestation of a broad, deep, and enduring change in public attitude toward the forests." One study will be noted in some detail to support the contention of changing public attitudes regarding nature.

Milbrath (1984) did a survey study involving the U.S., England, and West Germany, repeated after a three-year interval, looking at the environmental attitudes of groups he defined as significant. It is of interest that he did not hold resource managers as a separate and significant group! He described every society as having a dominant social paradigm (DSP), a belief structure that organizes the way people perceive and interpret the functionings of the world around them. To greatly simplify his explanation, Milbrath says that the DSP of our modem world is one of dominion, a belief in technological development combined with fierce competition for unceasing, unlimited progress, especially economic progress.

In both years of the study, this DSP was adhered to most closely by business and political leaders, with the general public holding the middle ground, and the environmentalists holding views most disparate from the DSP. There were country-by-country differences, but the pattern was the same in all three countries. The major finding of the second study was that both the general public and business and political leaders had moved toward the environmentalists in the three-year interval between studies, confirming Spitler's experience that "the modem industrialist more and more accepts the need for environmental controls and demands only a fair and reasonable approach' (Spider 1988).

Milbrath called the beliefs at the environmentalist end of the scales the NEW SOCIAL PARADIGM (NSP), as listed below:

1. A high valuation of nature.

2. A sense of empathy which generates compassion for other species, other peoples, and future generations.

3. A desire to carefully plan and act so as to avoid risk to humans and nature.

4. A recognition of limits to growth and the need to adapt our beliefs and actions to them.

5. A belief that we need a new society that incorporates new ways to conduct our economic and political affairs.

These beliefs, especially the first four, do not seem radical, but the degree to which they are held translates into the fifth, a willingness to reshape our

society and its institutions. It is also important to note how much of this NSP is related to social welfare or social ethics through such questions as who benefits and who pays, how do we handle the world's uneven distribution of resources, and how can forestry involve the people living on the land, and learn from them (at least in third world countries, forestry recently has responded through the activities of "social forestry"). The NSP also reflects a greater valuation of forests as spiritual and philosophical resources than as economic ones, an idea forestry may acknowledge but to which it has not necessarily responded well.

Milbrath believes that social changes begin fundamentally and are most widely expressed in the beliefs and values of persons, and that the NSP has a strong and real chance of becoming the DSP, even to the extent of titling his book "Environmentalists: Vanguard For A New Society." To extrapolate from a more recent work by Milbrath, each of us, and for purposes of this paper, the profession of forestry, is being forced to choose, by conscious action or through default, some position on the NSP-DSP continuum and to deal with the implications and issues this creates (Milbrath 1989). This kind of growing belief system is, in part, responsible for Flood's call for the 1990s to be "The Decade of Human Forestry" (Flood 1990).

What has this shift to do with enviromnental ethics as a way to promote the profession's public image? First, one of the social changes taking place is a lack of trust in "decisions by experts"; in our case, read "decisions by foresters." William Shields, Chairman of The American Forest Resource Alliance, recently said, "they (the public) begin by examining resource issues with the presumption that the resource must be protected from us" (Shields 1989). It is this public belief that has led to what Fortmarm (1986) has called the "last legal form of indoor blood sport" that many of us now participate in more frequently than we might wish---public hearings. But, to put a statement on environmental ethics in the SAF Code to enhance public relations seems to be doing the right thing for the wrong reason, and is reminiscent of Magill's charge that foresters seem more interested in changing the public's image of forestry rather than in responding to the public's goals, needs, desires, and values (Magi11 1988).

It does seem important for foresters to know whether they have underlying differences in value systems as compared to the public and other resource professions (Spitler 1988), or if they share a broad set of underlying values but differ in interpretation of facts and in the means to reach common goals (Davos 1988). Discussion of an environmental ethic for forestry will serve to reveal such commonalities and differences.

Proclaiming a land ethic that voluntarily sets higher standards for our profession than those expected for others should also provide a level of self-esteem and a sense of special relationship to the forest values we protect and manage (Flanagan 1981). Thus, while a statement of environmental ethics in our SAF Code of Ethics might be necessary as a symbolic action, like Martin Luther's 95 theses proclaiming, "Here we **stand,"** it is not sufficient, and the enhancement of our public image must and will come about only through our on-the-ground actions. Such actions, what SAF Vice-President Ross Whaley (1990) calls "demonstrated exemplary stewardship of the resources," should be framed, nonetheless, in a shared philosophy or wisdom, and an environmental ethic in the SAF Code can certainly serve as part of this shared wisdom.

Codes To Establish **Rules of Conduct**

The second reason for having professional codes is to establish enforceable rules of conduct (Vesilind 1987). Enforcement cannot be an end in itself, but has to be the instrumental means to the more basic reason for codes, that of enhancing the public welfare. But, establishing enforceable rules of conduct is of such great concern that it leads to several objections to a statement on environmental ethics, objections that apply to ethical statements and professional codes in general.

The first objection says that ethics are strictly a personal responsibility: a matter of honor (Vesilind 1987). If this were accepted, there wouldn't be any codes of ethics. But many professions, including forestry, do have such codes, and it seems, therefore, that the majority of professionals feel a need to codify relationship and rules of conduct, which to a large extent still remain personal and matters of honor, the code being only (but importantly) a means to internalize accepted standards. There are often practices that work only if they are widely agreed on via standards, rules of thumb, or orienting principles, and some sense of consensus is required for any ethical code that interrelates groups within society. Further, the values managed on forest lands--soil, water, air, wildlife, etc.--are more often than not public goods, even where forests are privately owned; and a personal ethic is inadequate for corporate goods that must be managed by persons acting in concert.

A second objection, and one noted in regard to a statement on environmental ethics in the SAF Code, is that, in our litigatious society, such a statement would open the door to many contentious, costly, and time-consuming lawsuits. Unfortunately, this may be true, but it is like saying let's not establish any rules of conduct because we might have to

enforce them! The potential for lawsuits emphasizes the need to be careful and clear with the wording of any statement or canon on environmental ethics.

Since lawsuits are also possible with the current canons, and since there is no great outcry about this possibility, the objection noted seems implicitly to recognize the current public awareness of land management issues and the public concern for the proper ethical treatment of the land as being separate and distinct from the individual and societal relationships covered in the current SAF Code. Such public recognition should at least give the profession cause to debate the need for a statement on environmental ethics.

In regard to possible litigation, it is also of interest that, unlike the starship ***Enterprise, we*** cannot boldly go where no man has gone before, because other professional resource management groups have statements regarding environmental ethics in their codes. For example, the Code of Ethics of The Wildlife Society sets out four objectives in a preamble to the canons. The first two are:

> (1) To develop and promote sound stewardship of wildlife resources and of the environment upon which wildlife and humans depend;
>
> (2) To undertake an active role in preventing human-induced environmental degradation.

The American Institute of Certified Planners, a group growing in significance, has a canon that says, "A planner must strive to protect the integrity of the natural environment." These two approaches suggest opportunities for the SAF, and should cause us to ask, "What makes forestry so different from wildlife or planning that we shouldn't or couldn't have a statement on environmental ethics in our Code?" Reversing this question and putting it in a more positive mode, we might ask, "What makes forestry unique so that it should have such a statement, especially when we consider Aldo Leopold's role in the modem environmental movement?" This will be examined in another section.

Finally, a third objection related to enforceable rules of conduct is that environmental ethics, or ethics of any sort, are subjective, while science is purportedly objective; or a related but not identical issue is that science is rational, while environmental ethics is emotional and, therefore, irrational.

But the opposite of emotional is not necessarily irrational; rather it is indifferent, stoic, insensitive. One can be emotional (passionate, excited, demonstrative) and rational. When foresters and other resource professionals equate the emotionalism of environmentalists with irrationality, I believe they fall into the trap of stereotyping. Environmental ethics is emotional, and, therefore, it is something environmentalist "do-gooders" have, while foresters have rational (unemotional?) science. With such a belief, a statement on environmental ethics in itself might seem irrational. Yet, an unguided applied science, such as forestry, is irrational.

It might be argued that a pure science is objective and rational, or value free, but an applied science, such as forestry, is value laden because the decisions about what to apply it to, what goals and benefits to obtain by applying it, who benefits and who pays, and other similar questions, are value laden and involve subjective emotions, such as whose preferences to satisfy.

At the extreme, but not unusual to be heard in resource professionals' conversations, the environmentalists are depicted as biocentric egalitarians, naturalist no-growthers, sentimental tree-huggers, and dickie bird lovers, who imply, if they don't say it outright, that humans are always the aliens and nature is always right. But, in turn, foresters and other resource professionals are often seen by the environmentalists as technological heroists, nature-conquerors, and land-rapers, scientists who see technology and not ethics, uses and not values, means and not ends, as the basic answers to problems, and who say that the ability to do something is reason enough to do it. If foresters find this description unflattering and wrong, there are two important questions that need to be asked. First, why are we perceived in such a manner? And second, if the environmentalists' stereotype of us is wrong, can it be possible that our view of them is wrong as well?

Regarding the subjectivity of ethics and the objectivity of science, there are some in modem science, especially quantum physics, who have come to the conclusion that the structures and phenomena we observe in nature are nothing but the creations of our measuring and organizing mind (Capra 1984). While this is not universally agreed upon, there is a consensus that what we choose to measure, how we choose to measure it, and the very act of measuring it creates changes and produces biases in the results we obtain. Davos (1988) discusses how our Baconian tradition causes us to subordinate values to facts, and goes on to show how the state of our art to measure and model natural systems, the subjectivity involved in choosing integration models and the weights given to factors in the models, and the uncertainty associated with natural systems make subjectivity inherent in "factual analysis." The old saw about science being a search for closer approximations to the truth is more real than ever as

scientists recognize that the world cannot be analyzed or managed as independently existing parts, but only in greater or lesser interconnectedness, a complicated web of relationships of which humans and their ethics are a part. Science, in other words, just isn't as objective as we try to make it out to be, and foresters can't hide behind it in some pseudo-religious act of faith. Experience also shows us that the basic ethical maxims have withstood the test of time for thousands of years, whereas the "truths" of science change yearly, if not more often (Hargrove 1987).

Wilderness, as much or more than other forest values, is a relationship, an intellectual process, and an action.

Codes & The Public Welfare

The first canon of the SAF Code of Ethics says, "A member's knowledge and skills will be utilized for the benefit of society"; and the most recent edition of the **SAF's** "Ethics Guide" says, "This is the canon which underscores the members' ultimate responsibility to serve the long-term interest of society as a whole" (SAF 1989). Synonyms for "ultimate" include "maximum" and "supreme," and if foresters' maximum and supreme responsibility is to serve the long-term interest of society as a whole, can **SAF's** Code of Ethics be complete without an expression of philosophy that includes behavior toward the land? We claim, after all, to be land managers, and, as Wolf pointed out, the current SAF Code could easily be applied to plumbing (Wolf 1989); in other words, what is in the current Code that reflects our special relationship to the land? I believe there is nothing.

Most foresters learned early in their education that trees are not only the product, but also the factory, not only the interest, but also the principal, and that one cannot injure or destroy the factory or deplete the capital without having long-term adverse affects. We have long espoused and practiced sustained yield and multiple use, albeit with exceptions, concepts contained in the modem themes of sustainable development and social forestry and in the modem ideas of environmentalism. It is interesting to speculate whether forestry has not created some of the public dissatisfaction with its practices by advertising such concepts to a greater level of success than the actual on-the-ground practice has attained. And, without doubt, we take pleasure in saying that foresters are the first environmentalists and in using slogans like "For A Forester Every Day Is Earth Day" (SAF **1990),** supporting and using movements that are attuned to the idea of environmental ethics.

The current Code deals with human relationships; foresters and society, colleagues, clients, and even bosses. It has become fashionable to stress the human dimensions of forestry; forestry students are told that we can't escape **people** by hiding in the trees because we practice forestry for people, with people, through people. Perhaps this has clouded our view so that we pay less heed than we should to the fact that the land, in the Leopoldian definition, is our ultimate (maximum, supreme) colleague, client and boss. In this sense, the need for a statement on environmental ethics comes about, I think, because we know the relationship it expresses is right. Whether for anthropocentric reasons, like believing that the environment is the foundation for the practice of forestry and must be protected to guard human interests, or for **ecocentric** reasons, such as believing in the inherent or intrinsic worth of the soil, water, air, the plants, and the wildlife, and the network of complex interactions that exists among them (and humans), that must therefore be protected for themselves, we not only know but we feel and are convinced it is right.

The Ethics Committee of the SAF has not pursued the idea of a statement on environmental ethics in the SAF Code because they believe that the "SAF Forest Policies & Positions" (SAF 1990) deals sufficiently with the issue.' The substance of these policies and positions is not at question, but just as the positions flow logically from the policies, so it seems the policies should flow from a more fundamental statement of mission or a philosophy of the role of forestry and foresters. The Code of Ethics provides the opportunity to make such a fundamental statement in a concise, easily disseminated form. The following suggestions for additions and changes to the SAF Code are based on and offered in the spirit of the above.

Including these changes, or something similar, in the SAF Code of Ethics provides a publicly stated professional commitment to living in harmony with the land, a task made ever more difficult with increasing populations, improving technology, and inequitable distribution of resources. Leopold believed in the need for individual commitment to land ethics, and foresters should exemplify such individual commitment. The time is appropriate, if not overdue, for forestry to synthesize that individual commitment into a powerful profession-wide commitment of service to the land as the basis for service to the people. But how is this related to

Table 1. Suggested additions and changes to the SAF Code of Ethics.

The canons of the current code could continue to be interpreted in their current human relations mode, as well as extending to a more environmentally sensitive mode if the Preamble were expanded as follows;

PREAMBLE
SAF CODE OF ETHICS

CURRENT	PROPOSED
The purpose of these cannons is to govern the professional conduct of members of the Society of American Foresters in their relations with the public, their employers, including clients, and each other as provided in Article VIII of the Society's Constitution. Compliance with these canons helps to assure just and honorable professional and human relationships, mutual confidence and respect, and competent service to society.	**This Code of Ethics is based on the belief that foresters must strive to accomplish three major tasks simultaneously: 1. provide & implement alternatives to help landowners reach their objectives; 2. insure an appropriate flow of goods, services, & values to meet society's needs; and 3. maintain & enhance the integrity of the ecosystems they work with, including both the land & human elements of these ecosystems, all by practicing good stewardship of the land.** The purpose of these canons is to govern the professional conduct of members of the Society of American Foresters in their relations with the public; their employers, including clients; each other; and with the land entrusted to their care as provided in **Article VIII of the** Society's Constitution. Compliance with these canons helps to assure just & honorable professional, human, and environmental relationships, mutual confidence and respect, and competent service to society.

wilderness and the **SAF Wilderness Management Working Group?**

WILDERNESS, ENVIRONMENTAL ETHICS AND THE SAF WILDERNESS MANAGEMENT WORKING GROUP

In a sentimental sense, wilderness managers and the SAF Wilderness Management Working Group should be interested in environmental ethics because Aldo Leopold was a forester, the father of modem wildlife management, a founder of The Wilderness Society, and a prophet of the modem environmental era. More fundamentally, since its earliest conception, wilderness has been a discussion of values, and it could be argued that the concept of wilderness was a foundation stone in the evolution of the New Social Paradigm (NSP) discussed earlier. Wilderness people seem to have tapped a vein, or better, they share one with a growing number of the public, of beliefs and values fundamental to the NSP. One way to examine this vein is to look at parallels between Leopold's three descriptions of conservation and compare them to wilderness ideas.

Leopold (1966) described conservation in at least three ways. First, he set it in the context of a relationshin when he said, "Conservation is a state of harmony between men and land" (p. 243). Second, he talked of conservation as an intellectual process, for example, when he said, "Conservation is our effort to understand and preserve" the capacity of land for self-renewal (p. 258), and in noting, "One of

the requisites for an ecological comprehension of land is an understanding of ecology" (p. 262). Finally, he saw conservation as an action, as in preserving the capacity of land for self-renewal (p. 258), or in the sense of husbandry that is "realized only when some art of management is applied to land by some person of perception" (p. 293). Wilderness, as much or more than other forest values, is a relationship, an intellectual process, and an action.

Wilderness As Relationship

Wilderness is a relationship in that it provides identity, is an artifact, and enhances harmony. Wilderness, and its companion wildness, are the crucible in which we, as a species, were forged. As we have come to value the cultural and ethnic diversity of our society and desire to preserve it, so too have we recognized the need to preserve the roots of the heritage of our species. As individuals wilderness also provides us identity by offering a challenge against which to test ourselves, even if that challenge lies only in knowing that the wildness exists, lurking near or far, just as the wildness within each of us lurks near or far and tests our ability to endure and grow. But wilderness is not only a test; we seek it also because we enjoy it, and that which we enjoy is one of the strongest marks of our identity. Wilderness has come to be seen as a home with intrinsic values; one which we can't truly leave and which we need to develop our evolving values.

Wilderness and wildness stand in another relationship to humans; they are identified only in comparison to culture or civilization, and they are artifacts in that they "can only survive by human understanding and forbearance that we now must make. The only thing we have to preserve nature with is culture. The only thing we have to preserve wildness with is domesticity" (Berry 1987).

When all was wild, there was nothing to measure wildness against, nor likely was there any concern to make such measure. Now wildness is measured against civilization, and like the art treasures of ancient civilization, its rarity provides value that emerged with civilization.

Finally, wilderness enhances a relationship of harmony. The harmony spoken of is not just the tranquility or internal calm that wilderness brings to many, for others find anxiety, agitation, or excitement in the presence of wild surroundings. The harmony of wilderness is that of an arrangement of parts in pleasing and functional relationships to each other, parts that can only be fully understood in relation to the whole system. The action and importance of this wholeness in wilderness is implicit in Rolston's statement that, "It is not form (species) as mere morphology, but the formative (speciating) process that humans ought to preserve" (Rolston 1986). A danger of test-tube speciation is that it is speciation out of context.

Wilderness As An Intellectual Process

Wilderness is an intellectual process in at least three ways; as a scientific baseline, as a source of recreation, and as a philosophical stimulus.

Change of any sort must be measured against something; change to something is only accomplished with change from something. Change is fraught with danger if one doesn't know the starting point, and even more so if one doesn't know how the starting point was arrived at. Management of forest ecosystems deals with change; purposeful change to obtain a value or purposeful reduction of change to maintain a value. Change in forested ecosystems must be measured against those systems that are the wildest, the least influenced by man. These wilderness ecosystems also serve as reservoirs of genes, species, and of the systems themselves.

Wilderness is first creation, in the base sense of the above: the starting point of evolution. It is recreation in the human sense because we seek it for pleasure and challenge, and, as Leopold noted, recreation in this case "is not the outdoors, but our reaction to it" (Leopold 1966). The pleasure and challenge may be on-the-ground, but it may also be vicarious, and it goes beyond substantive and economic needs. Rolston (1986) describes two kinds of positive recreational values: those, that involve activities which allow us to demonstrate skills, and those that provide the opportunity to contemplate nature's shows. The abundance of National Geographic specials, Nova, and other similar television programs indicates the great interest in wildness and wilderness in our society.

Wilderness is a philosophical stimulus as philosophers discuss and debate such seemingly esoteric issues as the objectivity and/or subjectivity of values in nature (Callicott 1987); whether ecosystems can have moral considerability (Salthe and Salthe 1989); deep ecology; eco-feminism; the morality of hunting; animal rights; and so on. While such issues may seem esoteric, we each have a dominant paradigm through which we filter and frame our world-view, and whether this is well thought out or not, it contains a philosophical stance on all of these and other issues that permeates our perspectives of those disciplines that we must understand and deal with to practice resource management: science, law, economics, sociology and psychology, education, and theology. The

movement to preserve wild areas was one of the first, and continues to be one of the most common, debates in the area of environmental philosophy and ethics. If, as Berry (1989) suggests in the very first issue of Earth Ethics, "both religion and economics need to establish the ecosystems of planet earth as normative for their own proper functioning," wilderness advocates must be at the forefront of the debate.

Wilderness As Action

Wilderness is action in that in itself it is dynamic, it requires a long-term commitment, and it requires management. "Preservation" is a misnomer in its implication that it maintains the status quo. Succession, including the effects of natural disasters, means that wilderness can be more honestly said to preserve a process rather than a form (ecosystem), and it is this process we are asked to consider ethically.

But the form may go on apparently unchanged for many decades, and to preserve either the form or process requires a long-term commitment even for the shortest of early succession forests. It was the call to beware of short-term expediency, especially economic expediency, that Leopold stressed.

If, in Leopold's terms, health is the capacity of the land for self-renewal, and conservation is our effort to understand and preserve this capacity, then conservation and preservation are not polar extremes, but rather preservation is conservation in being wise use. The battles between conservationists and preservationists have tended to solidify positions instead of finding common ground, creating confusion among the various publics, and among resource professions, as well. Very recently, Wood (1990) declared:

> As representatives of the land we are a house divided. The cleavage between those who see management as total control and those who see conservation as total restraint is clear. Less clear is the separation among those who see their first duty as short-term service to people and those who give their first service to land that it may serve people.

A land ethic could serve as common ground, and the common ground that is becoming more apparent is encompassed by the concept of stewardship. Conservation, including its form "preservation," is stewardship. We are entrusted with the land not only for ourselves, but for current and future others, and to leave the land in as good or better shape than we received it, we must manage it. The public's desire for good stewardship, and the need to manage wilderness if stewardship is to be achieved, was never more evident than in the Yellowstone fires of recent years. Further, some in the profession feel that forestry is in the midst of a paradigm shift that will put more emphasis on land health (Behan 1990), although others feel there is no need for such a shift, nor is one occurring (O'Keefe 1990).

As an ethical concept, stewardship will be better understood by all if resource professionals have defined and stated principles to work up to, and wilderness managers once again have the historical bases for providing leadership to see that this comes about by working toward the inclusion of a statement of environmental ethics in the SAF Code of Ethics.

CONCLUSIONS

If "the challenge of a 'revolution' in wilderness management" on existing wilderness areas must be the focus of the next 25 years (Fege and Corrigall 1990), the incipient revolution in individual environmental ethics that seems to be taking hold in our country also offers wilderness managers the opportunity to continue, and to enhance, their role in bringing credibility to resource professions by stressing values rather than uses, commitment rather than expediency. The common scientific and intellectual grounds already exist; it is the resolution of differences in attitudes and values that must occur. Agreement on a land ethic for the SAF would be one small step toward this resolution. It is fitting to close with words from Aldo Leopold (1966), who said, "That land is a community is the basic concept of ecology, but that land is to be loved and respected is an extension of ethics."

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ENDNOTES

1. During the November Council meeting, the national Ethics Committee intends to propose specific language to incorporate the Land Ethic as the first Canon in the SAF's Code of Ethics. The Ethics Committee is aware of HSD's recommendation concerning the Land Ethic. The Ethics Committee has identified a set of principles that echo the Land Ethic Issue Discussion we had during the HSD meeting (in Washington, D.C. at the annual convention).

MEETING THE WILDERNESS CHALLENGE: THE ROLE OF SAF AND THE ACADEMIC COMMUNITY

James D. Absher*

As we proceed toward the 21st century, finding ways to smoothly manage wilderness areas will be increasingly difficult. Bumps along the way seem inevitable. As has been noted by many other speakers at this conference, this is, in part, due to societal factors like increasing urbanization or shifts in the level of knowledge and understanding that the American public has, in general terms, about what wilderness is and how it is managed. It is also, in part, due to the lack of a capacity on the part of management agencies to come to grips with the emerging need for professionalization and specialized knowledge that wilderness management, apart from other aspects of land management, requires. This is especially true because wilderness management, like its closest analog, recreation resource management, requires a strong ability to deal with people and their values. It is also true because potentially there is a need to consider wilderness management as separate and distinct in its philosophical basis from other, more commodity oriented, resource uses.

My objective here is not to repeat many of the arguments that support these propositions but instead to speak to the role that we as researchers, professionals or academics have in this evolution of a more modem, comprehensive wilderness management decision making system. I wish to begin by accentuating the one major difference that may divide us, if we let it, from earlier resource management schema. Toward this end, let me pose a small "test."

Think about how you approach wilderness management in the most abstract sense. In particular, what philosophical position or status do you give to the wilderness? Do you subscribe to, or work under, the kind of utilitarian logic that so predominates our field? Or, do you now prefer instead to see wilderness management decisions as based on some sense of organic wholeness, at least out to the boundary of the wilderness area? Do wilderness areas have a kind of "life force" all their own that we must value and safeguard? Would you argue for the "rights" of trees against production forestry, even if the latter idea includes the production of recreational opportunities as well as sawlogs?

For wilderness managers especially, notions such as "transformational leadership" or "non-anthropocentric values" must be just as much a part of our professional vocabulary as "present net worth" or "Pinus ponderosa."

Even though there are no clear-cut answers to these questions your response to them can be revealing. Let me present three options. If this "rights" of trees approach seems a strange or antithetical approach to management decisions you are, from a 21st century standpoint, perhaps "part of the problem." If you can see the logic inherent in giving over such "rights," duties or obligations but are yet to be convinced that this is a practical or necessary approach, then maybe you're "on the way." If, as a final choice, you find this type of a philosophical presupposition compelling and you have some enthusiasm for it, at least conceptually, then I would give you an "A" for vision and challenge you to let us all know how you think such a set of new values might be incorporated into, or sometimes merely replace, the utilitarian logic now in place. You are indeed in this sense "part of the solution."

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The point I'm making is one of world-view but it does have a practical side. We should all feel a twinge of remorse for the loss of organic wholeness that comes from the alterations of the wilderness by our actions. Yet, we must cut trees (trail clearing, hazard trees, etc.) or otherwise alter the landscape, even if only by decisions that allow impacting uses. Nonetheless, we should not easily dismiss such decisions. Simple utility does not seem to go far enough. More sophisticated and discerning resource management must come to grips with a broader land ethic, especially in wilderness areas where their very integrity is to be valued.

Going further, such changes in individual perspectives and personal commitment must be the basis for transforming organizational ones. This includes a wide range of things such as codes of ethics, broad agency policy, or on-site management decision making. And, clearly, the Society of American Foresters (SAF) working groups and academically-linked professional organizations have a role, if not a responsibility, to push this agenda forward.

Speaking of organizational perspectives, it is also clear that wilderness management in the 1990s and beyond will require a working knowledge of a broader range of topics that might be lumped under the term "human dimensions." (This is the phrase a group of wildlife-oriented professionals have chosen and it seems to fit well.), By this I mean learning about and from our constituencies: More than just public involvement programs or surveys of the on-site users. We must also inquire into how the profession relates to these diverse, often conflicting, publics and the values they espouse.

Another organizational imperative is that we must engage the political process and add other aspects of public administration and organizational management to our professional repertoire. Biological training has not been sufficient for some time now, but neither is the older alliance of biological and economic training that replaced it. For wilderness managers especially, notions such as "transformational leadership" or "non-anthropocentric values" must be just as much a part of our professional vocabulary as "present net worth" or "Pinus Donderosa."

We are fortunate to have had in leadership positions within the SAF Wilderness Management Working Group forward-thinking, innovative people. But it is also obvious to me that this group, and other professional groups, to some extent still mirror the values of rather simple utilitarian conservation. This idea took root in turn of the century problems and has been tended by our profession. And it has flourished. But now this approach casts a shadow over wilderness management problems of today. In particular, as outlined above, we need to make the human dimensions of wilderness management, and the philosophically distinct problems of wilderness, much more central to the forestry profession as a whole. As an example, let me point out the difficulty of finding sufficient rationale on the basis of program strength to attend more forestry related functions like the SAF Annual Conference. Those of us with ties to geography, recreation, wildlife, fisheries and the various social sciences have found more fertile ground for the exchange of professional information in their meetings than at SAF. Thus, it is not surprising that the profession of forestry has languished and hasn't responded well to the emerging need for a properly constituted professionalization of wilderness management. We need to develop linkages to these other organizations, but not leave the primary job of professionalization to them.

We have the latitude to work on these problems, but no one is going to explicitly direct us to do so. It's our agenda; our profession.

My first (and major) conclusion is that in a push for professionalization we must take the individual initiative, generate the personal commitment, and work on establishing a new agenda for the Working Group. It will include many ideas we've heard at this conference such as the need for an OMB series, expanded non-governmental relationships, or standardized wilderness management training. And it will also include a broader set of issues such as a revised code of ethics which takes into account non-anthropocentric values or broad agency policy toward wilderness. I'm convinced that it can happen, but an advocacy group within a professional organization, we are going to have to bootstrap this one. We have the latitude to work on these problems, but no one is going to explicitly direct us to do so. It's our agenda; our profession. I encourage each of you to feel correct in embarrassing the SAF (or any other group) when they show a lack of concern or leadership for the issues we hold dear.

The alternative is to go on as we have and essentially abdicate any leadership position we might

now have in favor of emerging or newly-created organizations. But this is not the way to go. I think that there is a strong need for an organizational structure that speaks to, and for, wilderness management concerns. And soon such a group will emerge. In fact, it's probably inevitable. It's up to us to take on these professional needs as central to our SAF Working Group.

Fortunately, our timing couldn't be better. The recent rise in environmentalism gives us the opportunity to promote new relationships, new knowledge and new values for the profession. These circumstances also provide the next real test of our commitment, resolve and vision. If we can't make progress on these issues now I doubt there will be much hope on the downside of the issue-attention cycle. Let's take advantage of it while we can. Indeed, we can bring life to the recent SAF bumper sticker in ways that the public relations group that approved it probably never dreamt of. It read: "For a Forester, Every Day is Earth Day." Or, at least it should be.

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Twenty-eight papers addressing the nonrecreational uses and values of wilderness, including preservation, scientific, human development and other amenity uses, are presented in five sections: an introduction to nonrecreational wilderness values; the place of nonrecreational values in the past, present, and future; the management of wilderness for nonrecreational values and uses; the positions of the federal agencies in meeting the management challenges; and roles for others in meeting the management challenges.